Vanderbilt University Graduate School

Graduate School

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Vanderbilt
University
1999/2000

Containing general information
and courses of study
for the 1999/2000 session
corrected to 15 June 1999
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 non-curricular matters and concerning withdrawal for medical or emotional reasons can be found in the *Student Handbook*

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Graduate School Calendar 1999/2000

FALL SEMESTER 1999

Classes begin / Wednesday 25 August
Last day to submit Intent to Graduate forms for December graduation / Friday 1 October
Homecoming / Saturday 9 October
Last day to withdraw from courses without academic penalty / Friday 22 October
Thanksgiving holidays / Saturday 20 November–Sunday 28 November
Final day for presentation of theses and dissertations for graduation in December /
    Thursday 2 December
Reading days and examinations / Wednesday 8 December–Thursday 16 December
Fall semester ends / Thursday 16 December

SPRING SEMESTER 2000

Classes begin / Wednesday 12 January
Last day to submit Intent to Graduate forms for May graduation / Friday 11 February
Spring holidays / Saturday 4 March–Sunday 12 March
Last day to withdraw from courses without academic penalty / Friday 17 March
Founder's Day / Friday 17 March
Final day for presentation of theses and dissertations for graduation in May /
    Monday 3 April
Reading days and examinations / Wednesday 26 April–Thursday 4 May
Commencement / Friday 12 May

Graduate Study at Vanderbilt

G RADUATE work 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. 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 the College of Arts and Science and 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-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 1,700 students. About 45 percent are married, 44 percent are women, and 28 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 1,700 full-time members and a diverse student body of about 10,000. Students from many regions, backgrounds, and disciplines come together for multidisciplinary study and research. To that end, the University is the fortunate recipient of continued support from the Vanderbilt family and other private citizens.

The 316-acre campus is about one and one-half miles from the downtown business district of the city, 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:

College of Arts and Science.   Bachelor of Arts, Bachelor of Science.

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

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.

School of Law.   Doctor of Jurisprudence.

School of Medicine.   Doctor of Medicine, Master of Public Health.

School of Nursing.   Master of Science in Nursing.

Owen Graduate School of Management.   Master of Business Administration.

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 (1866 Southern Lane, Decatur, Georgia, Telephone number 404-679-4501) to award Bachelor's, Master's, Specialist's, and Doctor's degrees. Vanderbilt is a member of the Association of American Universities.

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 Department of Biology, and the social sciences is conducted in Buttrick, Calhoun, Furman, Garland,

and Wilson halls. Graduate work in religion uses the full facilities of Vanderbilt Divinity School.

The Stevenson Center for the Natural Sciences, a complex of seven connected buildings, includes laboratory and lecture facilities for chemistry, geology, mathematics, molecular biology, psychology, and physics. A 60-centimeter telescope in the Arthur J. Dyer Observatory, situated on a 1,131-foot hill six miles south of the campus, is used in astronomy.

Classrooms and laboratories of Peabody College are used for graduate instruction in education and psychology and human development. The John F. Kennedy Center for Research on Education and Human Development is a national center for research on mental retardation and related aspects of human development. The center serves a number of related purposes for the University, including close collaboration with several units of the Medical Center. Scientific inquiry in the center is organized into several biomedical and behavioral research groups.

Laboratories for the biomedical sciences—biochemistry, cell biology, cellular and molecular pathology, microbiology and immunology, molecular physiology and biophysics, and pharmacology—are in the Vanderbilt Medical Center. The A. B. Learned Laboratories provide additional facilities for molecular biology.

Graduate work in engineering uses the laboratories of the School of Engineering, including those in the Olin Hall of Engineering.

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

The Jean and Alexander Heard Library

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

The Jean and Alexander Heard Library is one of the important research libraries in the Southeast, with more than 2.5 million volumes in nine libraries. Most materials are shelved in open stacks and are available to students and faculty through Acorn, the library's integrated, automated system. Acorn also provides access to a growing number of full-text journals, as well as indexes and other research resources, and is accessible via the campus network and from workstations in each library.

The divisions of the Heard Library include:
Central Library   (contains resources in the social sciences and humanities)
Divinity Library
Education Library
Alyne Queener Massey Law Library
Walker Management Library
Annette and Irwin Eskind Biomedical Library

Anne Potter Wilson Music Library
Sarah Shannon Stevenson Science and Engineering Library
Special Collections and University Archives

For more information about library collections, facilities, and services, see the library's home page, *http://www.library.vanderbilt.edu.*

Computing Resources

Academic Computing and Information Services (ACIS), located in the Hill Center Expansion, provides computing services and resources to Vanderbilt students, faculty, and staff.

ACIS maintains and supports VUnet, the campus-wide data network that provides access to the Internet, as well as VUnet ID, which enables Vanderbilt users to identify themselves to certain services on VUnet. Services currently authenticated by VUnet ID include OASIS, the University's course registration system; VUmail, the University's electronic message system; and VUdirectory, the University's on-line directory service.

All campus residences are included in ResNet, which provides services for direct connection to VUnet. More information about ResNet can be found at *http://www.vanderbilt.edu/resnet.* For dial-up connection, ACIS offers VUaccess. For more information about VUaccess, visit *http://www.vanderbilt.edu/vuaccess.*

The ACIS Help Desk is an information center designed to help students, faculty, and staff find answers to questions about connecting to VUnet and using VUnet services. Help Desk locations, hours, contacts, and other information can be found at *http://www.vanderbilt.edu/helpdesk.*

For more information about computing at Vanderbilt, visit the "Computing at Vanderbilt" Web page, *http://www.vanderbilt.edu/compute.*

Vanderbilt Institute for Public Policy Studies (VIPPS)

Public policy research at VIPPS addresses laws, regulations, programs, and services focused on such real world issues as health care, education, mental health, social services, the environment, and economic development. In a typical year, the institute will have forty to forty-five active research projects under way. VIPPS operates through nine centers named for their major research interests: Child and Family Policy; Crime and Justice Policy; Environmental Management; Health Policy; Mental Health Policy; Psychotherapy Research and Policy; Research Evaluation and Methodology; State and Local Policy; and U.S.-Japan Studies and Cooperation. Each Center is led by a member of the faculty. Faculty fellows and senior fellows, research associates and assistants, and support staff are affiliated with the Centers. VIPPS faculty are truly interdisciplinary, currently representing the disciplines of psychology, sociology, political science, medicine, law, engineering, education, and economics. See the VIPPS Web site for more information, *http://www.vanderbilt.edu/VIPPS*.

Academic Programs

THE Graduate School accepts candidates for advanced degrees in forty-nine fields. Master's degrees are available in forty-two disciplines and the Doctor of Philosophy in forty. The following table lists degree programs and the degrees available. 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	52
Art History	X		145
Astronomy	X		232
Biochemistry		X	59
Biological Sciences	X		62
Biology	X	X	63
Biomedical Engineering	X	X	67
Cell Biology	X	X	72
Cellular and Molecular Pathology	X	X	75
Chemical Engineering	X	X	78
Chemistry	X	X	82
Civil Engineering	X	X	86
Classics	X	X	90
Comparative Literature	X	X	94
Computer Science	X	X	98
Economics	X	X	103
Education and Human Development	X	X	112
Electrical Engineering	X	X	130
English	X	X	136
Environmental Engineering	X	X	141
French	X	X	148
Geology	X		152
German	X	X	156
Hearing and Speech Sciences	X	X	161
History	X	X	167
Latin American Studies	X		176
Liberal Arts and Science (M.L.A.S.)	X		179
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Management of Technology	X		190
Materials Science and Engineering	X	X	193
Mathematics	X	X	197
Mechanical Engineering	X	X	204
Medical Physics	X		208
Microbiology and Immunology	X	X	210
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Molecular Physiology and Biophysics		X	216

ACADEMIC PROGRAMS (continued)	MASTER'S	Ph.D.	Page
Neuroscience		X	219
Nursing Science		X	222
Pharmacology		X	224
Philosophy	X	X	227
Physics	X	X	232
Political Science	X	X	238
Portuguese	X		289
Psychology	X	X	244
Psychology and Human Development	X	X	250
Religion	X	X	256
Sociology	X	X	283
Spanish	X	X	289
Spanish-Portuguese		X	289

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

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

Special Programs

Graduate Program in Economic Development

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

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

A special fee of $1,000 is required of all students in the program.

Center for Latin American and Iberian 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 and the Owen Graduate School of Management. For further information, see Latin American and Iberian Studies in the Courses of Study section.

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: biology, chemistry, earth science, economics, English, French, German, history, Latin, mathematics, physics, political science, and Spanish. Psychology and sociology are available as second endorsements to history, economics, or political science. The program is open to those already licensed to teach who want to add new endorsements to their licenses, as well as to others with a bachelor's degree who have had no professional training to teach and are seeking initial licensure.

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 established by the Office of Teacher Licensure to secure licensure recommendation. If review of the candidate's major field or liberal arts background reveals deficiencies, additional course work may be required.

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.

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, Russell M. McIntire, Jr., Associate Dean, College of Arts and Science, 311 Kirkland Hall, Nashville, Tennessee 37240; (615) 343-3140.

Master of Science in Biological Sciences

The program in Biological Sciences offers working secondary school science teachers the opportunity to earn an M.S. degree in four (to five) successive summers. The program includes didactic courses, didactic laboratories, and a research project on which a research thesis is based.

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 Medical School 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, biomedical engineering, cell biology, cellular and molecular pathology, microbiology and immunology, molecular biology, 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 advisers, from the other School, and from the Dean of 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.

If a proposed individual master's degree program has coherence, the Graduate Dean, following consultation, will appoint a faculty committee to establish the specific details of the program and supervise the student's progress. 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 the Ph.D. Except under extraordinary circumstances, interested students will be expected to apply, or make preliminary inquiry, to the Dean of the Graduate School during their first year of graduate studies.

Summer Session

The ten-week summer session, in which full-semester and in some cases full-year courses are offered, is available for part-time and transient students as well as for regularly enrolled students at Vanderbilt. Courses are offered in most programs, including a full curriculum in education.

Information concerning the summer session may be obtained on request from the Graduate School office. A summer session announcement containing a list of summer courses and a tentative schedule is available in mid-March of each year. Graduate students should apply for admission to the Dean of the Graduate School.

Academic Regulations

VANDERBILT'S students are bound by the Honor System inaugurated in 1875 when the University opened its doors. 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 *Student Handbook,* available at the time of registration, which contains the constitution and bylaws of the Honor Council and sections on the Graduate Student Conduct Council, Appellate Review Board, and related regulations.

Detailed descriptions of Honor System violations and procedures are published in the *Student Handbook*, available on the Web, *http://www.vanderbilt.edu*.

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.

The academic requirements listed below 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 the deadline date. Intent to Graduate forms are available in the Graduate School office.

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 Arts in Teaching (for secondary school teachers), and Master of Liberal Arts and Science (requirements described in a separate section below). 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 in which they are using the libraries or other facilities of the University.

Course Work

A minimum of 24 semester hours of formal course work is required for the master's degree. The courses may be divided between major and minor subjects. If there is a minor subject, it consists of courses outside the major, or it may center on a second area of interest within the major. Approved subjects and the proportion of the 24 hours allotted to each are specified by each program. All requirements for the master's degree must be completed within a six-year period calculated from the end of the student's first semester of enrollment in the Graduate School.

On recommendation of the student's program and approval of the Dean 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.

Certain students may enter graduate study at the master's level after having gained, as undergraduates, research experience and having completed a substantial amount of course work at advanced levels. For such students, in counting the 24 hours of credit required for the master's degree, one hour of credit for Master's Thesis Research 369 may, at the discretion of the program, be taken for each hour of 300-level formal course work previously completed as a Vanderbilt graduate student.

Prior approval of the director of graduate studies and the Dean is required in these special cases. Performance in course 369, Master's Thesis Research, will not affect the grade point average.

Thesis

The candidate shall submit two copies of the thesis to the Graduate School no later than the fourteenth day before the end of the term in which the degree is to be received; a candidate who expects to graduate in May must submit the thesis to the Graduate School not later than 1 April. The thesis is in addition to the 24 hours of course work required for the degree, and must give evidence of original investigation in the major subject. The title page of the thesis must bear the signatures of at least two graduate faculty members in the student's program. Each copy must bear original signatures; duplicated signatures are not permitted. A $34 fee is required for the binding of two copies of the thesis ($17 per copy). Detailed instructions as to the form in which the thesis is to be submitted may be secured at the office of the Dean.

The candidate shall furnish a thesis abstract of not more than two hundred fifty words.

Non-Thesis Programs

Special non-thesis Master's degree programs offered in anthropology, classics, computer science, economic development, environmental engineering, French, geology, German, hearing and speech sciences, Latin American studies, liberal arts and science, mathematics, medical physics, political science, Portuguese, religion, sociology, and Spanish specify additional course work or examination 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 27 semester hours of academic credit (nine courses) are required, with at least six M.L.A.S. courses (18 hours) and the option of selecting the remaining three courses (9 hours) from the regular course offerings available to graduate students. While students may elect a non-thesis program, a 6-hour thesis option is available as the final hours earned for the degree. 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. These courses must have been completed with the grade *B* or better and must be approved by the M.L.A.S. Advisory Committee.

Curriculum

A range of courses are 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. However, 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 in the major field and, if there is a minor, in the minor subject. 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 Dean 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 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 average.

"Formal course work" is understood to be 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.

A student's course work may be divided between major and minor subjects. If there is a minor subject, it consists of a series of courses in a field or fields outside the major subject, or it may center on a second area of interest within the major subject. Approved subjects, and the proportion of hours allotted to each, are specified by each program.

All students working full time toward the Ph.D. who are living in Davidson or adjoining counties are expected to 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 Dean on advice of the chair of the program. The committee consists of not fewer than five members of the Graduate Faculty. If there is a minor, at least one member comes from the student's minor area, and when the minor is taken within the department of the major, it is expected that a member of the committee will be from another department. If there is no minor, one member of the committee should be from outside the department. The committee must be appointed by the Dean 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 36 hours of graduate work (to include all course work required for the degree) and the language requirement, if any. In excep-

tional cases where the student has completed a substantial amount of undergraduate course work at advanced levels, a department or program may petition the Dean of the Graduate School to waive the 36-hour requirement. 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 eight semesters (preferably fewer) during which the student is registered, starting with his or her first enrollment as a Ph.D. student.

The qualifying examination may be written or oral, or both. A student is allowed only two opportunities to pass the qualifying examination. Results of the qualifying examination shall be forwarded to the Dean immediately after the examination.

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

Dissertation

A candidate for the Ph.D. degree must present an acceptable dissertation within the major field of study. 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 Dean of the Graduate School, a one-year extension of candidacy may be granted. A student may be readmitted to candidacy after such period has expired only upon application to the Dean of the Graduate School and with approval of the program faculty. In such cases the student may be required, by the Dean or by the Ph.D. committee, to demonstrate competence for readmission by taking a qualifying examination or additional course work.

The candidate submits two or more copies of the completed dissertation to the Ph.D. committee at least one month prior to the dissertation defense. The committee reviews the dissertation and conducts the final examination.

Two copies of the approved dissertation, bearing original signatures of not less than a majority of the Ph.D. committee, accompanied by two copies of an abstract of not more than three hundred fifty words and signed by the student's adviser, must be registered in the Dean's office no later than two weeks before the end of the term in which the student

expects to receive the degree. A candidate who expects to graduate in May must submit the dissertation to the Graduate School not later than 1 April.

The graduate is expected to publish the dissertation. The required method of publication is microfilming, and this service is handled by the Graduate School on the graduate's behalf. To ensure copyright protection, the dissertation should contain a copyright notice. After microfilming, both copies of the dissertation are bound and presented to the Jean and Alexander Heard Library.

The abstract is published in *Dissertation Abstracts,* which publicizes the completion of the dissertation and announces its availability on microfilm.

Microfilming does not preclude publication by other methods, but the student should know that microfilming is tantamount to publication and that a microfilmed dissertation, if not copyrighted, is in the public domain and may not subsequently be copyrighted in its original form. All microfilming, binding, and copyright fees must be paid at the time the dissertation is deposited with the Graduate School.

Final Examination

At least fourteen days before the end of the term in which the degree is to be conferred or by 1 April for May graduation, the candidate takes a final examination administered by the Ph.D. committee. The examination 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 University community is invited to attend the final examination, which is announced in advance in the weekly *Vanderbilt Register.*

The requirement for the final examination can be waived only on the written approval of the department, the Ph.D. committee, and the Dean.

The chair of the Ph.D. committee, after consultation with the candidate, shall notify the office of 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 Dean then formally notifies the Ph.D. committee and appoints such additional committee members as are desired. The result of the examination should be reported immediately afterward.

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 Dean of the Graduate School, transfer the certification if the student does so within three years after having received it.

International students may petition the Dean of 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 are defined as full time. Those registered for 6–8 didactic hours are half-time, and those registered for less than 6 hours are part time. After completing the hourly requirements for the degree, full time students register for master's (369) or Ph.D. (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 study to plan their schedules for the coming semester. All students must later complete official registration at the appropriate time using OASIS (On-line Access to Student Information Systems). At the beginning of each semester and the summer session, students must validate their registration by submission of a signed registration data form. A late registration fee of $30 is charged to students who fail to register on the stated registration dates.

All full time graduate students who are living in Davidson or adjoining counties are expected to register each fall and spring semester. In addi-

tion, all graduate students receiving scholarship, assistantship, fellow-ship, or traineeship support through the University must be registered each fall and spring semester as well as summer session in which they receive support.

Changes in Registration

Changes in registration may be made through OASIS during the change period (the first ten class days of the semester) with consent of the major department. A student is not permitted to add or drop a course, change the number of hours in a variable-credit course, or change from audit to credit status after the end of the change period. A student may be released from a course after the end of the change period by withdrawing formally from the course; a student is not permitted to withdraw from the course, however, after the mid-point of the semester. 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.

A course may be repeated with the consent of the adviser. Although both grades will be recorded on the transcript, the second grade earned will be the one used in computing the student's grade average.

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 of less than *C* is received. 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, or a *B* average, on all courses taken for credit is required for graduation.

Letter grades are assigned grade point values as follows:

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

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* automatically becomes permanent and remains 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. Audits are recorded on the student's record if the instructor certifies the student has been in attendance.

Academic Probation

A grade point average of 3.0, or a *B* average, on all courses taken for credit 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 Dean 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 is 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.

Credit

Courses 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 in the 200 and 300 numbered series have been approved by the Graduate Faculty for graduate credit; the same is true of four-digit numbered courses in religion (Divinity) 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 of the major department and approval of the Dean 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.

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 teaching schools at Vanderbilt must submit a formal application for admission and are expected to do so not later than the end of their first year of graduate-level studies at Vanderbilt.

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

Special Students

Non-degree students may register for selected courses in areas where they are qualified. Such students file an application and transcript of their previous academic work with the Graduate School. Approval of the instructor, the department in which the course is offered, and Dean of the Graduate School is required.

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 semester and are not candidates for a degree. Prior to enrollment, transient students must submit a special application, a transcript of their previous academic record, and a letter of good standing from the institution in which they are enrolled.

Leave of Absence

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

Candidates who have passed the qualifying examinations or completed 72 or more hours of credit toward the Doctor of Philosophy degree are not usually granted leave of absence, except in special circumstances (e.g., maternity or medical leave).

Withdrawal

Students who intend to withdraw from the University should inform the Graduate School in writing. Improper notification may result in loss of credit or other 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 Dean of the Graduate School.

In certain special cases, credit may be transferred for graduate-level coursework 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 Dean of the Graduate School.

Commencement

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

Admission

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

Generally, minimum requirements for admission are these: an applicant should have completed 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.

Application forms for admission to the Graduate School and for financial award are forwarded on request. The completed application form and a $40 nonrefundable application fee must be submitted before an applicant can be considered.

The deadline by which the completed application for fall admission and all supporting credentials should reach Vanderbilt is 15 January. Admission decisions for fall semester will be mailed by 31 March to all applicants whose files are complete by 15 January.

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

Students seeking admission for the spring semester should file applications no later than 1 November. Decisions are announced around 21 November.

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

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.

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 recommenda-

tion, 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. Formal admission to the degree program will be granted after the completion of two courses with at least a *B* average.

International Students

Vanderbilt has a large international community representing more than ninety countries. The University welcomes the diversity that international students bring to the campus and encourages academic and social interaction at all levels.

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 demonstrated competence while attending 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. Inquiries and requests for application forms should be addressed to TOEFL, Box 6151, Princeton, New Jersey 08541-6151 U.S.A.

The minimum acceptable score on the Test of English as a Foreign Language is 550. 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 English for Internationals (EFI). Intensive, semi-intensive, or part-time English study is offered throughout the year. Non-credit 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 EFI in consultation with the student's academic adviser. For more information, write to EFI, Peabody 510, Nashville, Tennessee 37203, U.S.A.; *http://www.vanderbilt.edu/EFI.*

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

United States laws and regulations restrict the opportunity for international students to be employed. Students may be allowed to work off cam-

pus only under special circumstances. Spouses and dependents of international students generally are not allowed to be employed while in the United States.

Health and Accident Insurance.   International students, whether attending the University full time or part time, and their dependents residing in the United States, are required to purchase the University's international student health and accident insurance unless, in the judgment of the University, adequate coverage is provided from some other source. Information concerning the limits, exclusions, and benefits of this insurance coverage may be obtained from Student Health Services.

Information.   Assistance in nonacademic matters before and during the international student's stay at Vanderbilt is provided by International Student Services, Station B 1568, Nashville, Tennessee 37235, U.S.A.; *http://www.vanderbilt.edu/EFI.*

Financial Information

T UITION in the Graduate School for 1999/2000 is charged at the rate of $958 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 (some special programs may 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 1999/2000 is $1,437 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 by mail for research hours needed for the degree. Such individuals should contact the Graduate School and request to be placed on the register-by-mail list. 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. Non-registered students maintain candidacy status by payment of a $50 fee each fall and spring semester. Because such individuals are not registered, they do not have student status and are not eligible for the usual student services, endorsements, and certifications.

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 authorization of the graduate dean.

Other Fees

Application	$ 40
Withdrawal from course after change period	10
Special fee for students in Economic Development	
Program ($333 per semester)	1,000
Student health insurance (estimate)	695
Ph.D. dissertation publication (microfilming)	55
Late registration	30
Student activities and recreation fees (estimate)	235
Thesis or dissertation binding (per copy)	17
Copyright fee for Ph.D. dissertation (optional)	35
Audit fee for regular students	10

Payment of Tuition and Fees

Tuition, fees, and all other University charges incurred prior to or at registration are due and payable in full on the first day of classes. All charges incurred after classes begin are due and payable in full by the last 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 for campus residents may result and additional charges to campus dining or flexible-spending accounts may be prohibited.

Refunds of Tuition and Housing Charges

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

Fall 1999 Withdrawal/Refund Schedule

Week 1	August 24–August 29	100%
Week 2	August 30–September 5	90%
Week 3	September 6–September 12	80%
Week 4	September 13–September 19	70%
Week 5	September 20–September 26	70%
Week 6	September 27–October 3	60%
Week 7	October 4–October 10	50%
Week 8	October 11–October 17	50%
Week 9	October 18–October 24	40%
Week 10	October 25–October 31	40%

No refunds after October 31, 1999

Spring 2000 Withdrawal/Refund Schedule

Week 1	January 11–January 16	100%
Week 2	January 17–January 23	90%
Week 3	January 24–January 30	80%
Week 4	January 31–February 6	70%
Week 5	February 7–February 13	70%
Week 6	February 14–February 20	60%
Week 7	February 21–February 27	50%
Week 8	February 28–March 6	50%
Spring Break	March 7–March 13	
Week 9	March 14–March 20	40%
Week 10	March 21–March 27	40%

No refunds after March 27, 2000

Tuition Payment Programs

Tuition payment programs are available through Tuition Management Systems (TMS). Pamphlets describing these plans are available on request from the Office of Student Accounts or the Office of Student Financial Aid.

Late Payment of Fees

Charges not paid by the first day of classes will be automatically deferred (the Office of Accounting may refuse to allow a deferment if in its judgment the deferment is unwarranted), and the student's account will be assessed a monthly late payment fee of $1.50 on each $100 that remains unpaid after the first day of classes ($5 minimum). An additional monthly late payment fee will be assessed unless payment is received in full on or before the last day of the month in which the student is billed.

Late payment fees will continue for each month thereafter based on the outstanding balance unpaid as of the last day of each month. All amounts deferred are due not later than 30 November for the fall semester, 30 April for the spring semester, and 31 July for the May and summer sessions.

Financial Clearance

Students will not be allowed to register for any semester if they have outstanding unpaid balances for any previous semester. Failure to meet this deadline may result in cancellation of registration. All new graduate and professional students must completed a "Graduate and Professional Student Charge Account and Deferment Agreement" prior to 1 July. Forms are available in the Office of Student Accounts. No transcript, official or unofficial, will be issued for a student who has an outstanding balance from a previous semester. Transcripts will be released when the account has been paid. 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 (Sarratt and University programs) and the student recreation fee will be waived automatically if the student is a part-time student registered for four or fewer semester hours and not registered in a thesis or dissertation research course, or if he or she resides, while a student, beyond an approximate sixty-mile radius from the campus as determined by zip code. Students who register late or students who want to have fees waived due to exceptional circumstances must petition for a waiver through the Office of Campus Student Services, Station B 6206, Nashville, Tennessee 37235. A $10 charge is assessed for processing the waivers of students who register late.

Transcripts

Academic transcripts are supplied by the University Registrar on written authorization from the student. Transcripts are not released for students with outstanding balances.

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. They are tenable for four years if the holders continue to fulfill the high promise for which they were chosen. When a student has had previous graduate training, the award may be given for three years.

Harold Stirling Vanderbilt Graduate Scholarships.   These scholarships provide a stipend of $3,000 per year in addition to regular assistantship or fellowship awards. The Student Affairs Committee of the Graduate Faculty Council reviews nominations from all graduate programs and makes its recommendations to the Dean of the Graduate School who then selects the recipients.

University Graduate Fellowships.   These premier fellowships provide a stipend of $5,000 in addition to a department's best award (fellowship or assistantship). Recipients are selected in the same manner as for the Harold Stirling Vanderbilt Graduate Scholarships.

Graduate Select Scholarships in Arts and Science

The Graduate School awards several Graduate Select Scholarships each year to new students admitted for study in the arts and science disciplines. The scholarships are given to outstanding students who have been awarded regular assistantships and fellowships in their area of study. A stipend of $3,000 is provided in addition to regular awards and is renewable for a total of four years if the student continues to maintain a high level of academic performance. Recipients are selected in the same manner as for the other honor scholarships.

Dean's Graduate Fellowships

Each year the Graduate School awards Dean's Graduate Fellowships to outstanding African American students 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 $13,000 for the 1999/2000 academic year and provide tuition and fees. Support is provided for four years with teaching duties required during the third year of study.

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 on page two of the Application and Guide to Admission, and if the application is complete by 15 January.

University Fellowships

University fellowships with stipends up to $11,300 for the nine-month academic year 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 salary ranging up to $13,000 for nine months or $15,000 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 $17,400 for twelve months are available in many graduate areas. The holder is expected to assist an individual faculty member in research. Full or partial tuition scholarships may accompany a research assistantship. The student may be required to pay a portion of his or her tuition from the assistantship salary.

Tuition Scholarships

Some departments or programs (e.g., the Graduate Department of Religion, programs in the School of Engineering, hearing and speech

sciences) offer service-free full or partial tuition scholarships without an accompanying fellowship or assistantship.

Teacher Training Awards

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

Other Graduate Fellowships

Various types of financial assistance other than University assistant-ships 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 $16,000 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, and certain institutional loan programs. Eligibility for the subsidized Federal Stafford Loan and the Federal Perkins Loan are based on financial need, but the unsubsidized Federal Stafford Loan is available regardless of need. (However, students are required to complete the need-based application process before an unsubsidized loan may be awarded.) Federal Stafford Loans are available through banks and other private lenders.

 Under the Federal Perkins Loan program, a graduate student may borrow up to $4,000 per year, for an accumulated total of not more than $30,000, including any Federal Perkins Loans borrowed as an undergraduate. Under the Federal Stafford Loan program, a student may borrow up to $18,500 per year ($8,500 subsidized and $10,000 unsubsidized), for an accumulated total of not more than $138,500, including any Federal Stafford Loans borrowed as an undergraduate.

In order to be considered for these programs, students must complete the Free Application for Federal Student Aid (FAFSA), the Vanderbilt Financial Aid Application for Graduate Students, and any other required application materials (which may include the College Scholarship Service PROFILE Registration and Application).

Detailed information on eligibility criteria and application procedures may be obtained by writing to the Office of Student Financial Aid, 2309 West End Avenue, Nashville, Tennessee 37203-1725.

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, consisting of one student representative from each graduate program, serves to ascertain graduate student opinion and communicate it appropriately. The council and its committees are available to students and members of the administration and faculty for consultation regarding matters concerning the Graduate School and the graduate student body.

Housing Facilities

The Office of Residential and Judicial Affairs provides apartment-style housing for as many graduate students as possible. Applications for housing will be mailed to all admitted students during the spring. Questions should be addressed to the Office of Residential and Judicial Affairs, Station B 1677, Nashville, Tennessee 37235. A $200 deposit is required at the time of application. Returning residents of University housing will be permitted to renew their leases until May 1. Incoming students in graduate and professional schools will receive priority for the remaining available housing for the fall if their applications are received by May 1. Any returning student may apply for on-campus housing by filing with a $200 deposit. After May 1, assignment is made on the basis of the date of application.

Apartments are leased for the entire academic year. Students who are assigned space on the campus are therefore committed for one year and should understand that only withdrawal from the University will cause the lease to be terminated.

Residential occupancy is subject to the terms and conditions of a lease executed by the occupants. Only full-time students at Vanderbilt are eligible for campus apartments. Apartments must be vacated within twenty-four hours if the occupants cease to be students.

University housing for graduate and professional students is available in the following facilities:

Lewis House, on the south side of campus, is an eleven-story apartment building with air-conditioned efficiency, one-bedroom, and two-bedroom apartments. Undergraduates live on the lower four floors.

The Family Housing Complex, located at the eastern edge of campus on Eighteenth Avenue South, has air-conditioned, town-house apartments with living room and kitchen downstairs and two bedrooms and bath upstairs. The apartments are designed for families with children.

The Garrison Apartment complex on Eighteenth Avenue South has air-conditioned efficiency and one-bedroom units. Single as well as married students are assigned here. TeleVU, the residence hall cable television system, and ResNet, the residential data network, are available in all apartments in Lewis House, Family Housing, and Garrison Apartments.

Off-Campus Housing

The Office of Residential and Judicial Affairs maintains a listing of available off-campus accommodations in the Nashville area. 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 by early July for suggestions and guidance.

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.

Identification Cards

Identification cards are multifunctional, serving as each student's library card, building access card, and, when combined with a campus dining or flexible-spending account, dining card that also can be used to make cash-free purchases throughout the campus (see Eating on Campus).

Identification cards are issued at the Vanderbilt Card Office. Validation of each student's card for the current semester will be made electronically each time it is used. For more information, see the Web site, *http://www. vanderbilt.edu/vucard.*

Eating on Campus

Vanderbilt Dining operates several food facilities throughout campus that provide a variety of food and services. There are three all-you-care-to-eat dinner plans available on campus during the academic year. Through a Vanderbilt Card account, a student can purchase food at any of the above-listed locations. Two accounts are available: the Flexible Spending Account (FSA) for purchases from the Bookstore or any other on-campus facility that accepts the Vanderbilt Card, and a Campus Dining Account (CDA) for food purchases. All first-year students living in freshman housing are required to enroll in the Dinner Plan, which provides seven all-you-care-to-eat meals a week for one price, paid at the beginning of the semester. For more information, visit the Web site, *http://www.vanderbilt. edu/dining.*

Services to Students

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 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 consent. One such situation is disclosure to school officials with legitimate educational interests. A school official is a person employed by the University in an administrative, supervisory, academic or research, or support staff position (including law enforcement unit personnel and health staff); a person or company with whom the University has contracted; a person serving on the Board of Trustees; or a student serving on an official committee, such as a disciplinary or 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.

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, address, telephone number, e-mail address, 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 student who does not wish disclosure of directory information should notify the University Registrar in writing. Such notification must be received by August 1st to assure that the student's address and phone number do not appear in any printed Vanderbilt

directory. No element of directory information as defined above is released for students who request nondisclosure. 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.

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 University Relations and General Counsel.

Vanderbilt Telephone Directory Listings

Individual listings in the student section of the *Vanderbilt Directory* will consist of the student's full name, school, academic classification, local phone number, local address, box number, and permanent address. Students who want their names to be excluded from the directory must notify the University Registrar, 134 Magnolia circle, in writing, by 1 August.

In addition to the paper *Vanderbilt Directory,* there is also an on-line VUnet e-mail directory accessible both on- and off-campus via the World Wide Web. At the time students initially set up their VUnet IDs and passwords, they have the option of withholding their e-mail address from this directory if they so choose.

Psychological and Counseling Center

The Psychological and Counseling Center is a broad-based service center available to students, faculty, staff, and their immediate families. Services include: individual and group counseling and psychotherapy for personal problems and issues; psychological assessment; group support programs for learning skills such as relaxation; assertiveness; marital communication; reading and study techniques; weight, stress, and time management; administration of national testing programs; career choice/change and college major counseling; outreach and consultation with departments; and campus speakers and educational programs.

Eligible persons may make appointments by visiting the Center or by calling 322-2571. Services are confidential to the extent permitted by law. For more information, see the Web site, *http://www.vanderbilt.edu/pcc.*

Career Center

The Career Center at Vanderbilt helps students and graduates of Vanderbilt University develop and implement career plans. This is accomplished by offering a variety of services and educational programs that help them assess career options, learn job search skills, gain career-related experience, and connect with employers. See the Web site, *http://www.vanderbilt.edu/career,* for more information.

Services include: career counseling and testing; a resource center; a alumni career advisory network; graduate and professional school services; career classes and seminars; résumé consultation; video interview training; internship information service; career and job fairs; campus interviews; job listings and résumé referrals; and alumni services.

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 status without charge and without copayment: visits to staff physicians and nurse practitioners; personal and confidential counseling by mental health professionals; routine procedures; educational information and speakers for campus groups; some routine laboratory tests; and specialty clinics held at the SHC.

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

Dr. John W. Greene, director of the Student Health Center, is a tenured faculty member of the Vanderbilt University School of Medicine. 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 a.m. to 4:30 p.m., Monday through Friday, and 8:30 a.m. until noon on Saturday, except during scheduled breaks and summers. Students should call ahead to schedule appointments (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 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 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 p.m. and 7 a.m. are handled by the Vanderbilt University Emergency Department triage staff.

More information is available on the Web site, *http://www.vanderbilt.edu/ student_health/vush.htm.*

Hospitalization Insurance Plan

All degree-seeking students registered for 4 or more hours at Vanderbilt are required to have adequate hospitalization insurance coverage. The University offers a sickness and accident 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 at registration, 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 20 August until 19 August 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. A new student must complete and return the acceptance/waiver card that is available at registration or in the Office of Student Accounts. This card must be submitted at or by registration for the fall or spring semester. A returning student needs to submit an acceptance/waiver card in order to change her or his current insurance status.

Family Coverage. Additional premiums are charged for family hospital coverage. Married students who want to provide coverage for their families may secure application forms by contacting the on-campus Chickering representative, 322-4688.

International Student Coverage

International students and their dependents residing in the United States are required to purchase the University's international student health and accident insurance plan. No exceptions are made unless, in the judgment of the University, adequate coverage is provided from some other source. This insurance is required for part-time as well as full-time students. Information and application forms are provided through the Student Health Center.

Services for Students with Disabilities

Vanderbilt is committed to the provisions of the Rehabilitation Act of 1973 and Americans with Disabilities Act as it strives to be an inclusive community for students with disabilities. Students seeking accommodations for any type of disability are encouraged to contact the Opportunity Development Center. Services include, but are not limited to, extended time for testing, assistance with locating sign language interpreters,

audio-taped textbooks, physical adaptations, notetakers, and reading services. Accommodations are tailored to meet the needs of each student with a documented disability. The Opportunity Development Center also serves as a resource regarding complaints of unlawful discrimination as defined by state and federal laws.

Each school has appointed a University Disability Monitor responsible for monitoring and improving disability services in academic programs. Contact your dean to find out the Disability Monitor for your school. Specific concerns pertaining to services for people with disabilities or any disability issue should be directed to the Assistant Director for Disability Services, Opportunity Development Center, Station B 1809, Nashville, Tennessee 37235; phone 322-4705 (V / TDD); fax 343-0671; *http://www.vanderbilt.edu/odc/*.

Child Care Center

Vanderbilt Child Care Center operates as a service to University staff members, faculty members, and students. The program serves children from six weeks to five years of age. The Center is accredited by the National Academy of Early Childhood Programs.

Security

The Department of Security (322-2745) exists to protect students, faculty and staff members, visitors, and the assets of the University. Campus officers are carefully selected through testing and interviews and are trained according to Police Officer Standards and Training (POST) requirements. The Department of Security enforces state laws and University regulations.

In order to meet its obligations and its duty to the Vanderbilt community, the Department of Security has programs and services in place to educate and protect our community. The Department of Security has an escort service that is available for persons who need an escort after dark between points on campus for personal safety reasons or for those who need transportation because of physical disability. The telephone number for the service is 421-1888.

Blue light emergency telephones are strategically placed around the campus. When the receiver is lifted, they automatically access Securityís 24-hour emergency line. Using this phone automatically identifies the area of the caller to our communications division. The emergency line can also be called by dialing 421-1911 (1-1911 on campus). The emergency phone system should be used to report medical emergencies, crimes in progress, fires or to request immediate assistance for a life-threatening situation. For emergency situations that happen off campus individuals should use 911 for response by local police, fire, and medical services.

The Crime Prevention Division of the Department of Security offers several programs to increase awareness among the Vanderbilt Community

and its neighbors. In addition to these services, it publishes and distributes informational resources on a variety of crime prevention topics. For further information on the programs and literature that are available call 322-2558 or e-mail *crimeprevention.atwood@vanderbilt.edu.*

Recovered property may be turned in at any time to the Department of Security. Inquires about lost items may be made by contacting Security's Lost and Found Division, Monday through Friday, 8:30 a.m. to 4 p.m. The telephone number is 343-5371.

Information on security measures and a summary of crime statistics for the Vanderbilt campus are available from the Department of Security, 2800 Vanderbilt Place, Nashville, Tennessee 37212. More information is available from the Web site: *http://www.vanderbilt.edu/VUPD/vupdhome.htm.*

Parking and Vehicle Registration

Parking space on campus is limited. Motor vehicles operated on campus *at any time* by students, faculty, or staff must be registered with the Office of Traffic and Parking. A fee is charged. parking regulations are published annually, and are strictly enforced.

Bicycles must be registered with the Department of Security.

Bishop Joseph Johnson Black Cultural Center

The Bishop Joseph Johnson Black Cultural Center (BJJBCC) provides African American educational and cultural programming for the University community, and retention services for African American students. Dedicated in 1984, and named for the first African American student admitted to Vanderbilt, Bishop Joseph Johnson (B.D. '54, Ph.D. '58), the Center reinforces Vanderbilt's effort to promote diversity through the development of programs that foster understanding and appreciation of the African American experience.

The Center provides a "home away from home" environment for African American students and sponsors lectures, symposia, academic materials, art exhibitions and other activities for the University and the community. Programs are publicized in a monthly campus calendar and a monthly newsletter, *News from the House,* which is distributed to African American students and other campus addresses by request. The Black Student Alliance (BSA) and the Cultural Center Advisory Board work closely with the Center. The Center is open to the campus for small meetings and gatherings.

Margaret Cuninggim Women's Center

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

Programs for students, staff, and faculty are scheduled throughout the fall and spring semesters and are publicized in the monthly newsletter *Women's VU,* which is distributed without charge to campus addresses on request. A student group that works closely with the Women's Center, Students for Women's Concerns, is open to all interested students, both male and female.

The Center houses a small library with an excellent collection of unbound materials such as clippings and reprints, as well as journals, magazines, and tapes. Books and tapes circulate for two weeks. Copy facilities are available.

Religious Life

The Office of the University Chaplain and Affiliated Ministries exists to provide occasions for religious reflection and avenues for service, worship, and action. There are many opportunities to clarify one's values, examine personal faith, and develop a sense of social responsibility. Major service projects through the Office of Volunteer Activities include the Alternative Spring Break, the Vanderbilt Prison Project, Habitat for Humanity, and the Student Y.

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

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

Extracurricular Activities

Sarratt Student Center

The Madison Sarratt Student Center (*http://www.vanderbilt.edu/sarratt*) provides a wide variety of programs and activities for the campus community. The Center, named for a popular former dean of students, houses a cinema where classic, foreign, and first-run films are shown; an art gallery; art studios and a darkroom for classes and individual work; work space for student organizations; comfortable reading rooms and lounges; an upscale pub; and large and small meeting rooms. The Center's six student-run committees plan concerts and events that take place throughout the campus, and the Sarratt Main Desk serves as a Ticketmaster™ outlet, handling ticket sales for most of the University's and Nashville's cultural events. Sarratt will undergo extensive renovations, and portions of the building and some programs will be closed during the 1999/2000 school year.
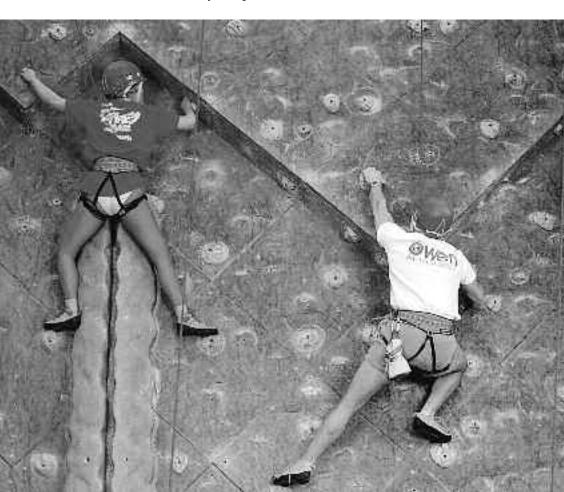
Recreation and Sports

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 swimming, volleyball, racquetball, fly fishing, and scuba, along with rock climbing and kayaking. Twenty-three 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 swimming pool; three courts for basketball, volleyball, and badminton; six racquetball and two squash courts; a weight and Nautilus room; a wood-floor activity room; a rock-climbing wall; an indoor track; a mat room; locker rooms; a Wellness Center; and the Time-Out Cafe. Lighted outside basketball and sand volleyball courts and an outdoor recreation facility complement the center.
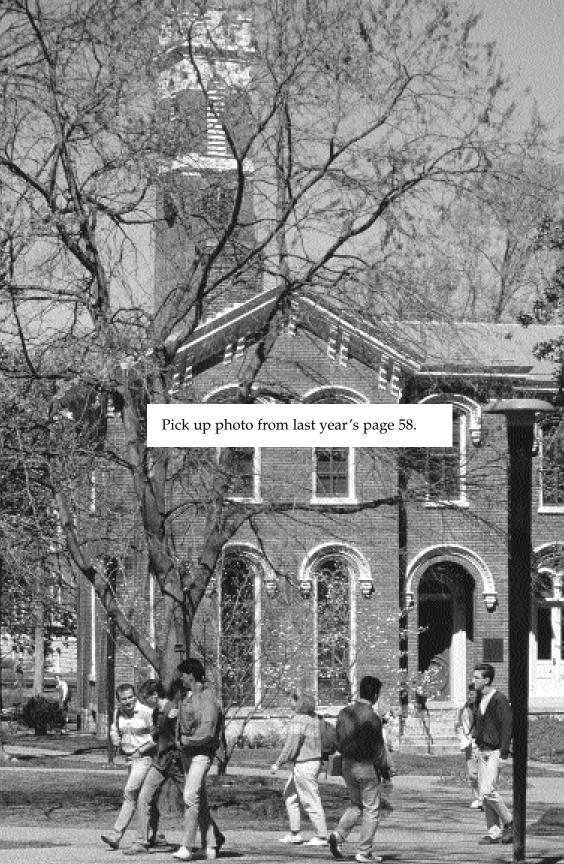
Courses of Study

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

Explanation of Symbols

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

300-level courses 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 Dean of the Graduate School. Courses in the graduate programs 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*. If the numbers are the same, the student has less option.

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.

Pick up photo from last year's page 58.

American and Southern Studies

❧ THE graduate-level component of the American and Southern Studies Program provides a sequence of courses by which students enrolled in graduate programs in disciplinary departments (e.g., history, English, political science) may gain knowledge and expertise in the interdisciplinary study of the history and culture of the U.S. South and its relationship to America. The program's intent is to bring graduate students and faculty together who share an interest in American and Southern studies, allow them to share one another's disciplinary views, and stimulate further interest in interdisciplinary study. The program is directed by Larry Griffin *(Sociology)* and supervised by a committee that includes David Carlton (*History*), Dale Cockrell *(Blair)*, Thadious Davis *(English)*, Jimmie L. Franklin (*History*), Vivien Green Fryd *(Fine Arts)*, Michael Kreyling *(English)*, Richard A. Pride *(Political Science)*, and Cecelia Tichi *(English)*.

No degree is currently offered, but a field of minor concentration may be constructed with the approval of the student's adviser and the director of American and Southern Studies. Courses in this program are customarily offered in alternate years.

204. Self, Society, and Social Change. (Also listed as Sociology 204) Problems and prospects for individual participation in social change; volunteering, community service, and philanthropy; role of individuals and voluntary associations in social change. FALL. [3] Cornfield (Sociology).

212. Southern Literature. (Also listed as English 212) The works of southern writers from Captain Smith to the present. Topics such as the Plantation Myth, slavery and civil war, Agrarianism, and "post-southernism." Authors may include Poe, Twain, Cable, Faulkner, Welty, Percy, Wright. FALL. [3] Kreyling (English).

222. Classical Tradition in America. (Also listed as Classical Studies 222) 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] Wiltshire (Classical Studies.) (Offered 2000/01)

223. Women and Law. (Also listed as Sociology 224 and Women's Studies 224)) History of laws subordinating women and efforts by feminists to achieve substantive and procedural equity. American historical examples augmented by comparative research. Examines employment law, laws making rape and domestic violence illegal, and tax law. FALL. [3] Steinberg (Sociology).

247. American Political Culture. (Also listed as Political Science 247) 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. SPRING. [3] Pride (Political Science).

258. The South in American Culture. (Also listed as Sociology 258) The changing relationship between the South and the rest of the country and its effects on understandings and definitions of the South in southern social structures and patterns, race relations, and economic and political institutions. [3] Griffin (Sociology). (Offered 2000/01)

270. The Frontier in Early America: War and Cultural Interaction. (Also listed as History 267) Frontiers in North America, 1500–1763. War, trade, and cultural exchange among the

native, British, French, and Spanish residents of North America. The meaning of cultural frontiers and of cycles of peace and war in borderlands. (Not currently offered)

277. Asian American Literature. (Also listed as English 277) Diversity of Asian American literary production with specific attention to works after 1965. Topics such as gender and sexuality, memory and desire, and diaspora and panethnicity in the context of aesthetics and politics of Asian American experience. SPRING. [3] Chen (English).

278. History of Appalachia. (Also listed as History 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. SPRING. [3] Carlton (History).

281. The United States and the Vietnam War. (Also listed as History 281) Origins of American involvement, the reasons for escalation, and the Vietnamese response to intervention. The impact on America's domestic politics, the growth of the anti-war movement, and the economic, social, and cultural effects of the conflict. SPRING. [3] Schwartz (History).

310. Topics in American Culture and Character. Topics as announced in the *Schedule of Courses.* May be repeated twice for credit when topics vary. FALL. [3]

311. Introduction to Southern Studies. Major texts and methodologies of Southern Studies. [3] (Not currently offered)

312. Research Seminar in Southern Studies. Disciplinary approaches to research, research methodologies, resources, archival sources. [3] (Not currently offered)

Anthropology

CHAIR Thomas A. Gregor
DIRECTOR OF GRADUATE STUDIES Arthur A. Demarest
PROFESSOR EMERITUS Ronald Spores
PROFESSORS Arthur A. Demarest, Volney P. Gay, Thomas A. Gregor,
    Alice Carmichael Harris
ASSOCIATE PROFESSORS Beth Ann Conklin, William R. Fowler, Jr., John D. Monaghan
ASSISTANT PROFESSORS Edward F. Fischer, Brian E. Hemphill, John W. Janusek
MELLON ASSISTANT PROFESSOR Annabeth Headrick

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 twenty 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, and ethnohistory of Latin America.

The Ph.D. program requires at least 45 hours of formal course work and four semesters of residency. A basic level of proficiency in two foreign languages or a high level of proficiency in one 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 30 hours of graduate credit.

201. Introduction to Linguistics. (Also listed as Linguistics 201) 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. FALL. [3] Harris.

203. Anthropological Linguistics. (Also listed as Linguistics 203) Introduction to language in its anthropological context. Topics include theories of the origin of language, prehistory of languages and language groups, the use of vocabulary as a guide to ways societies classify their universe, and possible deterministic interrelationships between language and culture. SPRING. [3] Staff.

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. SPRING. [3] Conklin.

207. Energy, Environment, and Culture. The relationship between human beings and the environments that sustain them. The global diversity of human ecological adaptations. Hunter-gatherers, pastoral nomads, slash-and-burn agriculturalists, and irrigation agriculturalists. Human impact on the environment. Theories of human ecological interaction. FALL. [3] Joyce.

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

210. Peoples and Cultures of Latin America. Survey of Latin America, including both its native cultures and its Spanish and Portuguese heritage. Fundamental traditions of Latin America, including marriage and the family, the relationship between men and women, racial and ethnic identity, social class, and religion. Special attention to the organization of peasant communities, contemporary urban life, poverty, and economic development. FALL. [3] Fischer.

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

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] (Not currently offered)

213. The Archaeology of the Ancient Maya Civilization. The civilization of the ancient Maya peoples, the most advanced culture of the pre-Columbian New World. Lectures and readings cover the archaeological evidence and social theory on the enigmatic origins, complex nature, and sudden collapse of this ancient civilization. FALL. [3] Demarest.

214. North American Indians. A comparative survey of the Indian societies of North America, their archaeological origins, development, and changing adaptation to white society over the past four hundred years. FALL. [3] Fowler.

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

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

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

219. Origins of African American Culture. Archaeological, historical, and anthropological perspectives on African American culture, both before and after slavery. Continuities from Africa; responses to oppression; and the creation and maintenance of cultural identity. [3] (Not currently offered)

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

224. Political Anthropology: Crosscultural Studies in Conflict and Power. Comparative and ethnographic analysis of political and legal systems. Formal and informal means of control in egalitarian and hierarchical societies. Anthropological theories of power, authority, influence, and leadership. Social and cultural dimensions of conflict, consensus, competition, and dispute resolution. SPRING. [3] Staff.

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

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

227. Civilizations of Prehistoric Europe. The prehistoric background of Europe from the Paleolithic to the Iron Age. Special attention to regions north and west of the Alps in light of ancient economy and society. The beginnings of settled life and innovations that contributed to its development. [3] (Not currently offered)

228. Family, Marriage, and Kin. The family, household, division of labor, and obligations of kinship in non-Western societies. Marriage, age and gender, and kinship networks in relation to economics and political life. Comparisons with kinship in Western cultures. SPRING. [3] Gregor.

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

230. Environment and Archaeology. Human impact on environment, subsistence, and settlement. The contribution of archaeology, geology, and botany to human ecology. SPRING. [3] Joyce.

231. Archaeology of Africa. Prehistory and history from the emergence of first humans to development of indigenous civilizations and states. Emphasis on Subsaharan Africa, including early hunter-gatherer adaptations, the ecology of pastoralist and agricultural economies, and the rise of socially stratified societies. FALL. [3] Junker.

232. Peasant Societies and Their Development. Origins and nature of peasant society in Asia, Africa, Latin America, and Europe. Theories of formation, transformation, and rebellion of peasantry. Theories of development, planning, administration, and evaluation of development programs. Issues of community integration and local autonomy. [3] (Not currently offered)

233. Culture, Ecology, and International Development. Theories of development and social change in Third World societies. Case studies of development programs in peasant and tribal communities in Asia, Africa, and Latin America. Ecological, social, and political issues in problems of food and agriculture, rain forest development, and grassroots development strategies. SPRING. [3] Conklin.

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. FALL. [3] Fischer.

235. Peoples and Cultures of South Asia. South Asian society from hunting and gathering populations to contemporary social groups. Archaeological and historical perspectives on the rise of caste, divergence of South Asian religions, and fragmentation of South Asian society. Cultural perspectives on ethnic and regional diversity, caste relationships, and population history. [3] (Not currently offered)

237. Ethnicity, Race, and Culture. Key concepts used in the history of anthropology to explain social diversity; theories of racial typology, cultural traditions, and ethnic identity. Role of rituals and symbols in expressing social identity and group membership. Crosscultural comparison of pluralistic and homogeneous societies. Relation of ethnicity to ties of kinship, language, heritage, religion, and nationality. Changes in interethnic relations through assimilation, acculturation, cooperation, and polarization. SPRING. [3] Staff.

239. Archaeological Research and Field Methods. Theories of modern archaeological research. Participation in actual field excavation. Research design, sampling, reconnaissance, mapping, data recording, and conservation. SUMMER. [3] Staff.

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

241. Peoples and Cultures of Oceania. Cultural adaptations by Melanesian, Polynesian, and Micronesian peoples of the Pacific Islands. Topics include ecology, religion, exchange, warfare, and male/female relationships.SPRING. [3] Howard.

243. Introduction to Nahuatl Language, Culture, and Literature. Introduction to grammar and lexicon. Relationship of language to Nahuatl culture. Texts in translation and exercises in reading Nahuatl texts. [3] (Not currently offered)

244. Intermediate Nahuatl Language, Culture, and Literature. Continued study of grammar, reading of texts of historical and anthropological importance. Anthropological implications of language structure and Nahuatl lexicon. [3] (Not currently offered)

245. Art of Pre-Columbian America. (Also listed as Fine Arts 245) The great artistic traditions of pre-Columbian America, including the Aztec, Maya, Inca, and native North American. Styles, symbolism, and the role of art in native politics, history, and religion. [3] (Not currently offered)

247. The Aztecs. Origins of the Aztec peoples of central Mexico and their culture; history and structure of the Aztec empire; pre-Columbian social, political, and economic organization; warfare and religion; the Spanish conquest; colonial society in central Mexico; ethnographic study of modern descendants of the Aztecs. SPRING. [3] Fowler.

248. Ancient Empires and Civilizations of South America. Introduction to the archaeology and peoples of ancient South America. Early hunters and gatherers, origins of agriculture and urbanism, and the rise and fall of the Huari and Inca empires. [3] (Not currently offered)

249. Indians of South America. Hunters and gatherers, tropical forest peoples, chiefdoms, and great civilizations of native South America. Portuguese and Spanish influences. Emphasis on major anthropological studies and comparisons with other cultural areas. [3] (Not currently offered)

250. Shamanism and Spiritual Curing. A crosscultural inquiry into shamanism and sorcery. Examines altered states of consciousness, hallucinogens, spirit possession, and nontraditional techniques of curing. Contrasts shamanism with Western approaches to curing. Implications for religion, theories of the mind, and dream analysis. FALL. [3] Conklin.

251. Chiefdoms. The origins, evolution, and organization of the world's chiefdoms and other pre-state societies. The rise of social stratification and political hierarchies. The organization of production and exchange. A comparative perspective with ethnographic, historical, and archaeological evidence. SPRING. [3] Junker.

252. Native American Art. The art and aesthetics of native peoples throughout the Americas. The relationship of art to social life, myth, and religion. Changes since contact with European cultures. SPRING. [3] Staff.

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. FALL. [3] Janusek.

256. Art of the Maya. (Also listed as Fine Arts 256) Architecture, painting, and sculpture from 100 B.C. to artistic traditions of contemporary Maya peoples. Ritual, religion, mythology, and politics. FALL. [3] Fischer.

257. Mesoamerican Art. (Also listed as Fine Arts 257) Worldview as expressed by painting, sculpture, and architecture from 2000 B.C. through the sixteenth century. Impact of religion and politics on the cities of the Olmec, Zapotec, and Aztec as seen through their artistic traditions. SPRING. [3] Fischer.

260. Medicine, Culture, and the Body. (Also listed as History 206) Concepts of the human body from historical and cross-cultural perspectives. Exploration of experiences, representations, and medical theories of the body in birth, death, health, and illness in Western and non-Western societies. Comparison of methodologies of anthropology and history. SPRING. [3] Conklin and Tuchman (History).

263. Myth and Legend: The Anthology of Oral Tradition. Narrative traditions and folklore of Western and non-Western cultures. Myths of world creation, human origins, and transformation. Relationship of myth to dream, historical narrative, and social organization. Myth telling and performance. The structure and theory of myth. SPRING. [3] Fischer.

264. Models of the Mind. Theories of the human mind, consciousness, soul, and self from Western and non-Western perspectives. The models of the mind expressed by myths, theologies, medical systems, and private fantasies. Methods used in anthropology, psychiatry, and religion. Consent of instructor required. [3] (Not currently offered)

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

266. Gender and Cultural Politics. Crosscultural comparison of women's roles and statuses in western and non-Western societies. Role of myths, symbols and rituals in the formation of gender identities and the politics of sexual cooperation, conflict, and inequality. Case studies from Africa, the Middle East, Europe, North and South America, Asia, and Melanesia. FALL. [3] Conklin.

270. Human Osteology. Growth, development, and alteration of the human skeleton. Determination of age, sex, stature, and ethnicity from bones and teeth. Archaeological skeletal remains for diagnosis of disease and identification of cultural practices. Use of human remains in criminal investigation. Three lectures and one laboratory period per week. SPRING. [4] Hemphill.

271. Human Evolution. Structural and behavioral changes in hominids leading to modern `Homo sapiens` Evolutionary theory, paleontological evidence, and nonhuman primates as the bases for interpreting sequential development of pre-modern humans. Prerequisite: 103. [3] (Not currently offered)

272. Human Variation. Biological differences among contemporary human groups. Adaptational features of humans as biological organisms. Use of biological variation for understanding human history and geographic distribution. FALL. [3] Hemphill.

273. Primate Evolution. Evolution and diversification of primate order from the first primates to the rise of the Great Apes. Skeletal anatomy, evolutionary theory, and living primates as bases for exploring the development of nonhuman primates. Prerequisite: 103 or 173. FALL. [3] Hemphill.

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. FALL. [3] Staff.

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

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

302. Quantitative Methods in Anthropology. Statistical methods for anthropological problem solving. Univariate and bivariate statistics, with selective coverage of more complex multivariate techniques. Use of standard software. FALL. [3] Junker.

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

305. Seminar in Ethnohistory. Ethnohistorical methodology. Historical documentation in anthropological studies. Prerequisite: consent of instructor. May be repeated for credit if topics are sufficiently different. SPRING. [3] Fowler.

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

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

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

311. Advanced Archaeological Methods. Advanced discussion of methods in Anthropological Archaeology. Special attention to research design, survey, field documentation, archaeological conservation, architectural rendering and analysis, computer applications, preparation of reports and interpretations of finds. Evaluation of field work in the old and new worlds. [3] (Not currently offered)

312. Ancient Maya Hieroglyphic Writing. Maya hieroglyphic script from the Formative Period to the sixteenth century. Antecedents, history, calendrical system, linguistics, theory of writing systems, and recent approaches to decipherment. [3] (Not currently offered)

313. Yucatec Maya Language and Literature. Introduction to the spoken and written language of the Yucatec Maya. Course will emphasize linguistic analysis and cultural concepts. Discussion of Maya literature from ancient texts to modern poetry and prophecy. [3] (Not currently offered)

315. Seminar on Cultural Evolution. Theories, evidence, and approaches to culture change and the evolution of the state and civilization. Prerequisite: consent of instructor. [3] (Not currently offered)

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

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

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

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

330. Seminar on Cannibalism. Cannibalism as cultural practice and cultural symbol in Western and non-Western societies. Perspectives from anthropology, literature, psychology, and history. Emphasis on cannibalism's role in constructions of the self and identity, memory and mourning, ethnic hierarchies, warfare, colonialism, primitivism and social criticism. French, English, Spanish, and Portuguese literature and ethnographic accounts from the sixteenth century to the present. SPRING. [3] Conklin.

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. FALL. [3] Fowler.

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] (Not currently offered)

351. Seminar in Oaxacan Archaeology. The origins of agriculture, rise and fall of Zapotec and Mixtec civilizations, ideology, economics, interregional interaction, and ethnohistory. [3] (Not currently offered)

355. Seminar in Mesoamerican Art. [3] Headrick.

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

369. Master's Thesis Research. [0]

370. Biological Anthropology. Major aspects of biological anthropology. Evolutionary theory, sociobiology, primate behavior, evolution of primates, medical anthropology, and human evolution, adaptation, variation, and osteology. [3] (Not currently offered)

399. Ph.D. Dissertation Research.

Archaeology

See Classical Studies and Anthropology

Art

See Fine Arts

Astronomy

See Physics and Astronomy

Biochemistry

CHAIR Michael R. Waterman
DIRECTOR OF GRADUATE STUDIES Marcia E. Newcomer
PROFESSORS EMERITI Harry P. Broquist, John G. Coniglio, Leon W. Cunningham,
     William J. Darby, Willard R. Faulkner, Robert A. Neal, Oscar Touster, Benjamin J. Wilson
PROFESSORS Richard N. Armstrong, Jorge H. Capdevila, Richard Caprioli,
     Graham F. Carpenter, G. Roger Chalkley, Walter Chazin, Frank Chytil, Stanley Cohen,
     F. Peter Guengerich, Tadashi Inagami, Lawrence J. Marnett, David E. Ong,
     Neil Osheroff, John A. Phillips III, Virginia L. Shepherd, James V. Staros, James P. Tam,
     Conrad Wagner, Michael R. Waterman
RESEARCH PROFESSOR Donald W. Horne
ASSOCIATE PROFESSORS Carl G. Hellerqvist, Scott W. Hiebert, Marcia E. Newcomer,
     Thomas N. Oeltmann

RESEARCH ASSOCIATE PROFESSORS Robert J. Cook, Benjamin J. Danzo,
  Raymond L. Mernaugh
ASSISTANT PROFESSORS Charles F. Albright, Bruce Carter, Jeffrey S. Flick,
  Youngchang Kim, Joachim Ostermann, Jennifer Ann Pietenpol, Wayne P. Wahls,
  Ronald M. Wisdom, Zhizhuang Zhao
RESEARCH ASSISTANT PROFESSORS Paul J. Flakoll, Changlin Fu, Norio Kagawa,
  Diane S. Keeney, Sergey A. Krupenko, Masaaki Tamura, Barbara Wamil

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 301, 302, 327, and 330 for a total of at least 24 hours of formal course work toward the Ph.D. degree (including sixteen hours in the first year).

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

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

Major research efforts are concerned with studies on mechanisms of mutagenesis; cytochromes P450, regulation of expression and mechanisms of detoxification; oxygenase and arachidonic acid biochemistry; vitamin A binding proteins and metabolism and action of vitamin A; proteinase inhibitor structure and regulation; DNA-binding proteins; DNA topoisomerase; biochemistry of epidermal growth factor action; biochemistry and endocrinology of hypertension; intracellular signaling in growth and development; neoplastic transformation by oncogenic transcription factor; and one-carbon metabolism. These studies use state-of-the-art technology including molecular biology, NMR spectroscopy 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, biochemical nutrition, molecular biophysics, cancer research, reproductive biology, and molecular endocrinology.

301. Molecular Structure and Function. This course considers the use of structural biological methods to answer important questions of function in systems involving two interacting species. Topical examples of protein-protein, protein-ligand, and protein-nucleic acid interactions are considered. Each example illustrates the use of multiple complementary approaches, which may include mutagenesis, kinetic, chemical, spectroscopic, and diffraction methods. SPRING. [3] Armstrong, Beechem, Guengerich, Kim, Marnett, Newcomer, Stone, Waterman.

302. Advanced Genetics: Biochemistry and Cell Biology. Advanced concepts in genetics and cell biology will be reviewed using a combination of lectures based on textbooks and discussion sections based on manuscripts. Prerequisite: IGP core course or consent of instructor. FALL. [3] Albright, Flick, Ostermann, Wisdom.

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] Newcomer.

324. Receptor Theory, Cell-Surface Receptors, and Signal Transduction Pathways. (Also listed as Pharmacology 324) 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. [3] Breyer, Carpenter, Shieh, Wadzinski.

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] Ong and Staff.

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

330. Scientific Communication. Development of critical skills necessary for evaluation, development, and execution of written forms of scientific communication, including research and grant proposals, manuscripts describing original research, review summaries, dissertations, and poster presentations. Course format includes lectures, individual and group projects, and class discussion of student presentations. FALL, SPRING. [1] Osheroff, Guengerich.

331. The Role of Carbohydrate Structures in Normal and Diseased States. Carbohydrate structures as biological response modifiers; in treatment of neoplastic growth; in bone marrow transplants; in cell differentiation and adhesion; in reproductive biology; in symbiotic and hostile microbial adhesion and invasion. The biosynthesis and chemistry of complex glycoprotein, glycolipid, and proteoglycan structures will be discussed. FALL. [2] Hellerqvist, Oeltmann.

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, molecular biology, chemistry of reactive intermediates, and a survey of several classes of environmentally important compounds. Prerequisite: a course in general biochemistry or consent of instructor. Three lectures per week. FALL. [3] Guengerich, Armstrong, Pietenpol, Graham, Burk, Stone.

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

341. Reproductive Biology. (Also listed as Cell Biology 333) A multidisciplinary approach to the study of reproductive biology. Lectures cover the structure, function, and hormonal regulation of the male and female reproductive tracts, oogenesis, spermatogenesis, sperm maturation, capacitation, implantation, fertilization, development, sexual differentiation, the onset of puberty, the menstrual cycle, pregnancy and parturition, techniques of assisted fertilization, and contraception. The structure, biosyntheses, and/or metabolism, molecular mechanism of action, and physiological effects of releasing hormones, gonadotropins, and sex steroids are discussed. While emphasis is on human reproduction, experimental results from animal studies are also used, when appropriate, to illustrate particular phenomena. SPRING. [2] Danzo and Staff.

349. Graduate Seminar in Molecular Biophysics. (Also listed as Molecular Biology 349) Lectures and discussions on a topic, which will change each year, in the area of molecular biophysics. May be repeated for credit. Prerequisite: consent of instructor. SPRING. [1] Stubbs and Staff.

369. Master's Thesis Research.

399. Ph.D. Dissertation Research.

Biological Sciences

CHAIR James V. Staros
PROFESSORS EMERITI Robert Kral, Oscar Touster
PROFESSORS Burton J. Bogitsh, Clint E. Carter, Douglas R. Cavener, Ellen Fanning, Sidney Fleischer, Hans-Willi Honegger, Carl H. Johnson, Wallace M. LeStourgeon, David E. McCauley, Gisela Mosig, Terry L. Page, James V. Staros, Gerald J. Stubbs, Dean P. Whittier, Robley C. Williams, Jr.
ASSOCIATE PROFESSORS William G. Eickmeier, Thomas N. Oeltmann, James G. Patton, Nils Olof Pellmyr, Charles K. Singleton, John H. Venable
RESEARCH ASSOCIATE PROFESSOR J. Oliver McIntyre
ASSISTANT PROFESSORS Bruce H. Appel, Daniel J. Funk, Todd R. Graham, Andrzej M. Krezel, Lilianna Solnica-Krezel, Laurence J. Zwiebel
RESEARCH ASSISTANT PROFESSOR Cheryl Ann Guyer

DEGREE OFFERED: *Master of Science*

❧ FOR several years, the Departments of Biology and Molecular Biology have jointly offered a summer program leading to the M.S. in Biological Sciences, specifically directed toward working secondary school science teachers. The program requires four to five successive summers and includes didactic courses, didactic laboratories, and a research project on which a research thesis is based. Except for the Graduate Seminar in Biological Sciences described below which is offered every summer, didactic course offerings, selected from those listed under Biology and Molecular Biology, differ from summer to summer.

An important part of the program is an original laboratory- or field-work-based research project which forms the basis of the M.S. thesis. Development of a thesis project begins in the second summer with the identification of a thesis mentor, and research becomes an increasingly important part of the program in the third and fourth summers.

An undergraduate program that includes courses in biological sciences and chemistry is an appropriate background for the M.S. program in biological sciences.

A new Department of Biological Sciences is being developed with the faculties of the Departments of Biology and Molecular Biology. This new department will eventually replace the two departments from which it was formed, and the degree programs currently offered by the Departments of Biology and Molecular Biology will be replaced by new programs offered by the Department of Biological Sciences. Students who entered the Graduate School through the fall 1999 semester will complete the programs described under the listings for Biology and Molecular Biology in this catalog. Students who plan to apply for entry in fall 2000 should consult the Department of Biological Sciences web site.

302. Graduate Seminar in Biological Sciences. Lectures and discussions on a broad range of topics in the biological sciences. Specific topics will change each year. May be repeated for credit. Open only to candidates in the summer M.S. Program in Biological Sciences. SUMMER. [2] Staff of the Departments of Biology and Molecular Biology.

369. Master's Thesis Research.

Biology

CHAIR Terry L. Page
DIRECTOR OF GRADUATE STUDIES Nils Olof Pellmyr
PROFESSORS Burton J. Bogitsh, Clint E. Carter, Hans-Willi Honegger, Carl H. Johnson,
    David E. McCauley, Terry L. Page, Dean P. Whittier
ASSOCIATE PROFESSORS William G. Eickmeier, Nils Olof Pellmyr
ASSISTANT PROFESSOR Laurence J. Zwiebel

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

❧ RESEARCH activities in the department encompass the study of biology at the cellular and subcellular, organismal, populational, and community levels. The faculty has primary research interests in the areas of biological clocks (circadian rhythms), ecology and evolution, insect physiology, neurobiology, parasitology, physiology of development, and systematics. Students may select either a laboratory-oriented or field-oriented

program of specialization or a program combining both.

Programs are offered leading to the master's and Ph.D. degrees, with emphasis on the doctoral program. The number of hours in a minor field and the distribution of course work in the program are determined with the assistance of the student's qualifying committee. As befits the broad scope of the department, Ph.D. students are required to demonstrate general biological competence. Although the department has no formal language requirement for the Ph.D. degree, when it is deemed important by the student's committee a reading proficiency in an appropriate foreign language may be required. A research thesis is required for the master's degree.

An undergraduate program emphasizing the biological sciences, with additional chemistry, calculus, and/or physics course work, is the most desirable background for graduate work in the Department of Biology, but students from other disciplines are also eligible.

201. Introduction to Cell Biology. (Also listed as Molecular Biology 201) Structure and function of cells, subcellular organelles, and macromolecules. Fundamentals of organelle function, membrane transport, energy production and utilization, cell motility, cell division, intracellular transport, and mechanisms of signal transduction. Prerequisite: Biological Sciences 110a–110b. Three lectures and one laboratory period per week. SPRING. [4] Graham (Molecular Biology), Zwiebel.

205. Evolution. Studies of evolutionary theory, with emphasis on evolutionary mechanisms. Micro-evolutionary processes of adaptation and speciation are discussed and related to macro-evolutionary patterns. Evidence from genetics, ecology, molecular biology, and paleontology are presented within the historical context of the neo-Darwinian synthesis. Three lectures per week. Prerequisite: 100 or equivalent. No credit for graduate students in the Department of Biology. SPRING. [3] McCauley.

206. Reproduction of Mammals. (Not currently offered)

212. Developmental Anatomy of the Vertebrates. An integration of developmental and phylogenetic approaches to an understanding of vertebrate morphology. Three lectures and two laboratory periods per week. FALL. [5] (Not currently offered)

213. Biology of Parasitism. Studies on various types of symbiotic relationships, with emphasis on parasitism. The nature, evolution, and physiology of human host-parasite relationships. Three lectures per week. FALL. [3] Bogitsh.

214. Parasitology Laboratory. Laboratory study of representative local forms. Field collections and laboratory experimentation illustrating some basic principles of parasitology. Two laboratory periods per week. May only be taken concurrently with 213. FALL. [2] Bogitsh.

215. Comparative Animal Physiology. Physiological principles exemplified by the major animal groups in their adaptations to environmental conditions. Prerequisite: 201. Three lectures and one laboratory period per week. FALL. [4] Honegger.

217. Invertebrate Zoology. Survey of the major invertebrate phyla except arthropods, emphasis on phylogenetic relationships, evolution, ecology, functional anatomy, and taxonomy with some reference to embryology and physiology. Three lectures and one laboratory periods per week. SPRING. [4] (Not currently offered)

218. Biology of Insects. An introductory survey of insects, with emphasis on diversity, taxonomy, and ecology. Two lectures and two laboratory periods per week before spring

break; seven days intensive fieldwork at Archbold Biological Station, Florida, during spring break; then individual study and final report preparation. SPRING. [4] Pellmyr.

220. Insect Ecology. Principles of insect ecology from individual to ecosystem level. Life history diversity, including parasite-host, predator-prey, and herbivore-plant relationships and their consequences at all levels of organization. Population dynamics and demography; community composition and dynamics. Conversation biology. [3] Pellmyr. (Not offered in 1999/2000)

221. Economic Botany. Plants in relation to human welfare. The origin, characteristics, and cultivation of cultivated plants. Topics include wood and forest products, paper, fibers, rubber, gums, resins, dyes, essential oils, spices, antibiotics, drugs, fatty oils, waxes, sugar, food, and beverage plants. Three lectures per week. SPRING. [3] Marr.

223. Vascular Plant Morphology. Developmental studies on the tissues, organs, and reproductive mechanisms of representative vascular plants (ferns and seed plants). Three lectures and one three-hour laboratory per week. FALL. [4] Whittier.

224. Spring Flora. Identification, classification, description, and naming of vascular plants. Development of identification skills in the laboratory and the field; diversity and economic significance (food, fiber, drugs, etc.) of selected major groups. Three lectures and one laboratory per week. SPRING. [4] (Not currently offered)

227. Ecological Physiology of Plants. Comparative study of physiological adaptations of plants to physical and biotic environmental factors. The ecological significance of such processes as carbon metabolism, water relations, nutrient relations, energy exchange, and others will be emphasized. Lecture and demonstrations. Prerequisite: 201. [3] Eickmeier. (Not currently offered)

228. Introduction to Immunology. (Also listed as Molecular Biology 228) The molecular and cellular basis of immunity. Emphasis on molecular structure, the genetic origin of diversity in B-cell and T-cell receptors, antigen presentation, and the cellular interactions leading to the immune response. Tolerance, tumor and transplantation immunity, autoimmune and immunodeficiency diseases, and allergy. Prerequisite: 201 or Molecular Biology 210. SPRING. [3] Carter.

230. Biological Clocks. Study of innate mechanisms for measurement of time in living organisms. Emphasis on the functional significance and physiological basis of biological clocks in animals and humans. Topics include circadian rhythms, time-compensated celestial navigation, photoperiodism, and the role of biological clocks in human behavior. SPRING. [3] Johnson.

234. Dendrology. An introduction to the taxonomy and silvical characteristics of trees, using local woody flora as well as the major woody components of forests throughout the United States and Canada. Two lectures and two laboratory periods per week, including field trips. [4] (Not currently offered)

235. Marine Biology. Analysis of diversity among plankton, plants, invertebrates, and vertebrates. Marine ecology, biology of fisheries, mariculture. FALL. [3] (Not currently offered)

238. Ecology. Development and structure of biological communities; interaction of environmental factors and of organisms within a community. Three lectures and one laboratory period per week, including field trips. FALL. [4] Eickmeier.

239. Behavioral Ecology. An evaluation and synthesis of some of the important problems at the interface of behavior and ecology. The evolution of sociality, kin selection, altruism, behavioral mechanisms of population regulation and competition, foraging theory, behavioral aspects of predator-prey interactions, courtship and mating systems, and sociobiology

and its implications. Three lectures and one discussion period per week. FALL. [4] Barthelmess.

240. Developmental Biology. (Also listed as Molecular Biology 240) Genetic, molecular, and cellular mechanisms underlying development of eukaryotic organisms with emphasis on insects and vertebrate animals. Topics include, regulator of gene expression during developmental processes, specification of embryonic polarity, generation and patterning of germ layers organogenesis, axonal specificity, evolution of chordate body plan. Prerequisite: 201 or Molecular Biology 210. FALL. [3] Solnica-Krezel, Zwiebel, Appel, and Bader.

247. Molecular Evolution. (Also listed as Molecular Biology 247) 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: 205 or Molecular Biology 210. [3] (Not currently offered)

248. Animal Histology and Histochemistry. The study of animal tissues and the procedures for the identification and localization of specific molecules within them. Prerequisite: Chemistry 220b. Three lectures and two two-hour laboratory periods per week. [4] (Not currently offered)

250. Laboratory in Developmental Physiology. Projects related to the physiology of development in simple and complex organisms. Fertilization, cell polarization, and tissue organization. Prerequisite: 240. [1] (Not currently offered)

252. Cellular Neurobiology. Structure and function of nerve cells. Emphasis on electrical excitability, synaptic transmission, and sensory transduction. Cellular mechanisms underlying simple behaviors, sensory information processing, and learning and memory. Prerequisite: 201 or Biological Science 110b. FALL. [3] Page.

253. Laboratory in Neurobiology. Laboratory studies focusing on experimental methods in neurophysiology. Introduction to techniques for recording membrane potentials, studying synaptic transmission, and analyzing neural mechanisms involved in sensory information processing and regulation of behavior. Pre- or corequisite: 252. FALL. [1] Page.

258. Human Physiology. (Also listed as Molecular Biology 258 and Molecular Physiology and Biophysics 281) Fundamental mechanisms of the major human physiological systems (nervous, circulatory, digestive, renal, muscular, endocrine, and reproductive). Emphasis on mechanisms of control and homeostasis and the integrated physiological response of the organism to external influences and disease states. Prerequisite: 201 or Molecular Biology 220. SPRING. [3] Oeltmann and Staff.

262. Plant-Animal Interactions. Ecology and evolution of species interactions at individual, population, and community levels; coevolution; pollination biology; fruit and seed dispersal; mammal and insect herbivore and plant defense mechanisms; ant-plant and animal-fungus interactions. Prerequisite: 205. FALL. [3] Pellmyr.

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. FALL. [3] McCauley.

274. Plant Evolutionary Biology. Comparative and experimental approaches. Genotypic and phenotypic variation, adaptation, phylogeny, chromosomal evolution, mating systems and life histories, pollination and gene flow. Applications of current methods including

isozyme, quantitative genetics, and DNA-based techniques. Prerequisite: 205 or Molecular Biology 210. [3] (Not currently offered)

313. Physiology of Parasitism. A biochemical approach to the study of host-parasite interactions. Emphasis will be placed on structural and biochemical adaptations which contribute to the parasites' survival in their hosts. Prerequisite: 201 and 213 or consent of instructor. Two lectures per week. [3] (Not currently offered)

316. Topics in Helminthology. Discussions in depth of selected topics that exemplify relationships between parasitic worms and their vertebrate and invertebrate hosts. Prerequisite: 213. Two lectures per week. [2] (Not currently offered)

319. Seminar in Zoology. [Variable credit: 1–2] Carter. (Not currently offered)

329. Seminar in Molecular Evolution. FALL, SPRING. [Variable credit: 1–2] Pellmyr.

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

338. Seminar in Ecology and Evolutionary Biology. FALL, SPRING. [Variable credit: 1–2] McCauley, Pellmyr.

342. Ecological Genetics. The application of genetics to the study of adaption of natural populations. Polymorphism under panmictic and nonpanmictic conditions; effects of ecological gradients and patchy, fluctuating, and marginal environments on selection, mating, behavior, and neutral alleles. Emphasis on theory and experimental evidence. Prerequisite: Molecular Biology 210 or consent of instructor. Three lectures per week. [3] (Not currently offered)

345. Biology Seminar. [Variable credit: 1–2] Carter. (Not currently offered)

350. Special Topics. Designed to allow students to become familiar with topics of special interest. Course content, admission, and hours by individual arrangement with departmental faculty. [Variable credit: 1–3] (Not currently offered)

369. Master's Thesis Research.

399. Ph.D. Dissertation Research.

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

Biomedical Engineering

CHAIR Thomas R. Harris
DIRECTOR OF GRADUATE STUDIES Robert J. Roselli
PROFESSORS Thomas R. Harris, Knowles A. Overholser, Robert J. Roselli,
    Richard G. Shiavi
ASSOCIATE PROFESSORS Robert Lee Galloway, Jr., Todd D. Giorgio,
    Frederick R. Haselton, Paul H. King, David R. Pickens III, Raphael Smith
ASSISTANT PROFESSORS E. Duco Jansen, Anita Mahadevan-Jansen, Cynthia B. Paschal

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, physiological optics, medical imaging, biomedical information and instrumentation systems, 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 courses approved by the program faculty and distributed as follows: biomedical engineering courses, 7 hours; life science courses, 7 hours; engineering subspecialty, 6 hours; science, mathematics, or engineering elective, 4 hours. In addition, the candidate must present a research thesis and pass a final oral examination.

Requirements for the Doctor of Philosophy degree are 48 hours of course work distributed as 15 hours in biomedical engineering, 11 hours in life sciences, 12 hours in advanced engineering or physical science, 10 hours of approved electives, and 24 hours of dissertation research. In addition, students must successfully complete a comprehensive written examination covering basic knowledge in biomedical engineering, pass a qualifying examination consisting of written and oral presentations of a proposal for doctoral research, present a dissertation showing the results of original research in biomedical engineering, and successfully defend the dissertation results in an oral examination.

251–252. Systems Physiology. An introduction to quantitative physiology from the engineering point of view. Descriptive physiology of several organ systems (in particular: heart, lung, kidney, nerve, blood). Mathematical modeling and computer simulation of organ systems and physiologic control mechanisms. Prerequisite: Math 229 or equivalent. [3–3] Staff.

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

271. Biomedical Instrumentation. 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. Instrument use and data analysis. Two lectures and one laboratory. FALL. [4] Galloway.

280. Introduction to Biomedical Computing. Provides introduction to basic medical information science, the use of computers in the creation of medical information (monitoring,

image analysis, patient information systems) and the use of advanced computer-based analytical methods to interpret medical information. Prerequisite: 263, 271; Math 233; introductory course in computers. [3] Staff. (Not currently offered)

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

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

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

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

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

315. Dynamics of Physiological Systems. Overview of linear representations of cardiovascular systems and introduction to rudimentary aspects of physiologic control. Topics relating to physiological systems identification. Format will be didactic in part, supplemented by seminar presentations, literature review, and computational problems. Prerequisite: knowledge of Laplace and Fourier Transform methods is required; 252 or equivalent is desired. SPRING. [3] (Not offered 1999/2000)

316. Medical Imaging. A survey of medical imaging modalities and applications. Emphasis will be placed on image formation and image analysis. Prerequisite: Physics 117b, General Physics; Math 230; ECE 200; or equivalents. SPRING. [3] Galloway.

317. Physiological Transport Phenomena. (Also listed as Chemical Engineering 317) The quantitative description of momentum transport (viscous flow) and mass transport (convection and diffusion) in living systems. Prerequisite: courses in fluid dynamics and mass transfer. [3] (Not currently offered)

318. Principles and Applications of Magnetic Resonance Imaging (MRI). Physics and engineering of magnetic resonance imaging with an introduction to biomedical applications of MRI. Topics include signal generation, spatial localization, pulse sequence design, Fourier transform reconstructions, image processing, instrumentation, artifacts, MR angiography, cardiac MR, and echo planar imaging. Prerequisite: Physics 117a–117b and Math 229 or equivalents; Math 230 or equivalent recommended. FALL. [3] Paschal.

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

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

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

350. Neural Networks. (Also listed as Electrical and Computer Engineering 350) Theory and application of parallel distributed processing networks. Basic neurobiology, biophysics of active membranes, neural network architectures, training algorithms, optimization, hardware applications. A network applications project is required. SPRING. [3] Bonds.

369. Master's Research. [0]

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

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

399. Ph.D. Dissertation Research.

Biomedical Informatics

❧ THE Division of Biomedical Informatics provides encouragement and guidance for interdisciplinary study related to applications of computer science, information science, decision science, and library science in health care delivery and biomedical research. Interested students are provided the necessary skills and experiences to lead in the development, evaluation, and implementation of informatics innovations. The program affords the opportunity for applied research in the clinical setting.

No degree is offered. Students may design a program of study in Biomedical Informatics through the Graduate School's Individualized Programs option. A field of minor concentration also may be constructed with the approval of the student's adviser and the Chair of the Division of Biomedical Informatics. Normally, such a minor will include appropriate course work in Biomedical Informatics and related courses.

201. Introduction to Health Informatics. Management and transformation of health data information and knowledge to improve health care. Focus on information systems in clinical settings and the use of databases for outcome management. Course work includes readings, discussions, presentations, and demonstrations of working health care information systems, and projects. FALL or SPRING. [3] Ozbolt.

290. Computer-Assisted Clinical Decision-Support Systems. Overview of principles of computer-assisted decision support, discussion of methodologies and implementation of illustrative systems. Participation subject to prior approval by instructor. [3] Geissbuhler. (Offered alternate years)

390. Biomedical Informatics Expert Systems Seminar. Review and discussion of landmark projects (dissertations, books, publications) in the field of biomedical informatics. A background in either biomedical science or computer science/biomedical engineering required. Participation subject to prior approval by instructor. FALL. [3] Miller. (Offered alternate years; offered 1999)

395. Special Topics in Hospital Information Systems. An exploration of issues related to data representation and distributed systems in the context of a computerized patient record. A project component provides an in-depth view of data conversion and records structure issues. [3] D. Guise. (Offered spring 2000)

396. Independent Study. Offered each term. [Variable credit: 1–3]

Biomedical Sciences

❧ EIGHT programs participate in this interdisciplinary program: biochemistry, cell biology, cellular and molecular pathology, microbiology and immunology, molecular biology, molecular physiology and biophysics, neuroscience, and pharmacology. During their first year, students take a core curriculum and conduct research in three laboratories before selecting the discipline in which they will earn the Ph.D. degree. Additional course work during subsequent years is appropriate to this discipline and the student's interests.

Ph.D. dissertation research may be conducted in any one of some 170 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.

300a. Bioregulation I. Fundamental aspects of macromolecular structure, disposition of energy, synthesis of supramolecular structure, information from within the cell, and the overall regulation of these activities. FALL. [6] Chalkley and Staff.

300b. Bioregulation II. Fundamental aspects of cell-cell communication and information flow through multicellular organs and the overall regulation of these processes. Includes immunologic defense, endocrine signalling, and molecular aspects of disease. SPRING. [3] Chalkley and Staff.

301. Methodology of Modern Laboratory Techniques. Techniques discussed include subcellular fractionation, electrophoresis, enzyme kinetics, centrifugation, restriction fragment polymorphism, oligonucleotide synthesis, DNA-protein footprinting, and ELISA and Western analysis. Emphasis is on the physical underpinnings of the techniques and on critical assessments of the results obtained. FALL. [2] LeStourgeon and Staff.

302. Techniques and Preparations. Seven-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] Chalkley and Staff.

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

399. Ph.D. Dissertation Research.

Biophysics

See Molecular Physiology and Biophysics, Physics and Astronomy

Cell Biology

INTERIM CHAIR Lynn M. Matrisian
VICE CHAIR Christopher V. E. Wright
DIRECTOR OF GRADUATE STUDIES Steven K. Hanks
PROFESSORS David M. Bader, R. Daniel Beauchamp, Alvin M. Burt III,
    Vivien A. Casagrande, Robert J. Coffey, Jr., Arthur Dalley, Thomas O. Daniel,
    Raymond N. DuBois, Jr., Ford F. Ebner, Steven C. Hebert, Brigid L. M. Hogan,
    Jeffrey T. Holt, Jon H. Kaas, Lynn M. Matrisian, Robert J. Matusik,
    Michael H. Melner, Harold L. Moses, Lillian B. Nanney, Eric Neilson, Gary E. Olson,
    Marie-Claire Orgebin-Crist, John Penn, J. Ann Richmond, Roland W. Stein,
    Daulat Ram Tulsiani, William O. Whetsell, Jr., Christopher V. E. Wright
ASSOCIATE PROFESSORS Carlos L. Arteaga, David P. Carbone, Kathleen Louise Gould,
    Steven K. Hanks, Stephen R. Hann, Roy A. Jensen, James McKanna, David M. Miller III,
    Jeanette J. Norden, Albert B. Reynolds, William Evans Russell, Linda Sealy
ASSISTANT PROFESSORS Mary Ann T. Arildsen, Stephen J. Brandt, Philip J. Browning,
    Chin Chiang, Jin Chen, Chand Desai, David I. Greenstein, Raul Guzman,
    Lawrence D. Kerr, Peter Kolodziej, Peng Liang, Claude M. Nagamine,
    David W. Threadgill, Elizabeth Yang

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 is divided equally between research and course work, including required (Cell Biology 310) and elective courses for a total of 24 hours of formal course work toward the Ph.D. degree (including 16 hours in the first year). A thesis-based

master's degree is awarded only under special circumstances. Graduate study in cell biology at Vanderbilt emphasizes an interdisciplinary approach to biological research. The department supports strong research programs in the areas of cancer biology, cell and molecular biology, developmental biology, neurobiology, and reproductive biology; graduate studies in each of these areas may include interdepartmental courses from Cell Biology, Biochemistry, Pharmacology, Psychology, Molecular Biology, 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 subcellular levels, utilizing biochemical, molecular biological, cell culture, physiological, and ultrastructural techniques in efforts to correlate structure and function.

310. Cell Biology. Current topics in cellular biology emphasizing relationships between structure and function at the cellular, subcellular, and molecular level. Review of classic and/or current literature relating to weekly topics in cell cycle, signal transduction, transcriptional and post-transcriptional regulation of gene expression, control of cell proliferation and differentiation, instructive interactions in development, tissue/matrix interactions, and mechanisms involved in regulation of translation and secretion. Development of critical approach to data interpretation and to the processes employed in the generation and experimental testing of a hypothesis. Prerequisite: Course work in first-year curriculum of the Interdisciplinary Graduate Program in the Biomedical Sciences. FALL. [4] Gould, Hanks.

321. Gross Anatomy. Devoted to a systematic dissection of the human body supplemented by lectures and demonstrations. Emphasis on the functional and clinical relevance of the anatomical structures. Class meeting dates determined by the calendar of the School of Medicine. Admission by consent of instructor. FALL. [7] Dalley.

322. Cell and Tissue Biology. A lecture/laboratory course designed to give students a familiarity with the properties of cells, in particular their interactions as components of the tissues and organs of the body. Emphasis on the correlates between structure and function at both the light and electron microscopic levels serves as a basis for understanding the physiological and biochemical activities of cells and tissues. Admission on consent of instructor. A microscope rental fee of $50 per semester is required. SPRING. [4] Staff.

323. The Nervous System. (Also listed as Neuroscience 323) Emphasis on providing second-year medical students and graduate students with a solid understanding of the organization of the human central nervous system, integrating basic information from neuroanatomy, neurophysiology, and neurochemistry. Covers the most up-to-date research conducted in neurobiology, with emphasis on research with potential clinical significance. Clinical material is provided by patient presentations, discussions of the impact of neurological disease on patients and their loved ones, and by an analysis of pathological cases. Four hours lecture and four hours laboratory per week. Microscope rental fee is required. FALL [3–4] Norden.

330. Seminar in Cell Biology. FALL, SPRING. [1] Nagamine and Staff.

333. Reproductive Biology. (Also listed as Biochemistry 341) A multidisciplinary approach to the study of reproductive biology. Lectures cover the structure, function, and hormonal

regulation of the male and female reproductive tracts, oogenesis, spermatogenesis, sperm maturation, capacitation, implantation, fertilization, development, sexual differentiation, the onset of puberty, the menstrual cycle, pregnancy and parturition, techniques of assisted fertilization, and contraception. The structure, biosynthesis and/or metabolism, molecular mechanisms of action, and physiological effects of releasing hormones, gonadotropins, and sex steroids are discussed. While emphasis is on human reproduction, experimental results from animal studies are also used, when appropriate, to illustrate particular phenomena. SPRING. [2] Danzo (Biochemistry) and Staff.

334. Topics in Growth Regulation. Discussion of current literature in mechanisms of cellular regulation. Emphasis on developing a critical approach to experimental design and interpretation of data. Admission by consent of instructor. [2] (Not currently offered)

335. Special Topics in Neuroscience. (Also listed as 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. FALL. [2] Casagrande.

336. Advanced Neuroanatomy. Designed for graduate and medical students who want to explore in more detail topics covered in Cell Biology 323. Emphasis on advanced neuroanatomical techniques (electron microscopy, freeze-fracture, fluorescence microscopy), on an understanding of original current research conducted in neuroanatomy, and on clinical correlations. Students may elect to emphasize clinical correlations and do three five-week rotations in various subfields of neurobiology (neuro-oncology, surgery, etc.). Admission by consent of instructor. FALL, SPRING, SUMMER. [2] Norden.

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. Discussion sections led by a faculty member follow each series of three to four seminars. SPRING. [1] Carpenter (Biochemistry) and Staff.

338. Special Topics in Cell Biology. Designed to provide an opportunity to pursue special problems in cell biology under the direction of individual members of the faculty in areas of mutual interest. Admission to course, hours, and credit by arrangement. FALL, SPRING, SUMMER. [Variable credit] Cell Biology Staff.

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] Hann.

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

341. Molecular Developmental Biology. This course focuses on three topics in Developmental Biology per year. Each topic or module lasts approximately one month (eight class periods). The most current information on the subject will be presented. The idea behind this course is to provide the student with the most up-to-date and comprehensive understanding of a focused issue in developmental biology. Topics for 2000 to be selected. SPRING. [Variable credit: 1–3] Bader.

342. Cancer Biology. (Also listed as Cellular and Molecular Pathology 342 and Microbiology and Immunology 342) A multidisciplinary course that emphasizes concepts of basic carcinogenesis and molecular mechanisms. Employs pathologic specimens and patient

presentations to illustrate the application of science to the study of human disease. SPRING. [4] Matrisian, Jensen (Pathology), Ruley (Microbiology and Immunology).

345. Cellular and Integrative Neuroscience. (Also listed as Neuroscience 345, Pharmacology 345, Molecular Physiology and Biophysics 345) This course provides a broad survey of current issues in cellular and integrative neuroscience. It is divided into four sections. Section I (Overview/Introduction) gives an introduction and overview of current issues in systems neuroscience. Section II (Nervous System Development) considers several current issues in developmental neurobiology using examples from the development of the visual system in both vertebrates and invertebrates. Section III (Chemical & Electrical Signaling) introduces contemporary issues concerning signaling molecules, transmitters, receptors, and channels. Finally, Section IV (Neural Networks/Learning and Memory) discusses mechanism and models of synaptic plasticity. This course uses original articles with an emphasis on discussion and student participation rather than lectures. Students are expected to come to class prepared to debate and discuss details of assigned papers. This course is the required entry level course for a neuroscience Ph.D. degree at Vanderbilt. Prerequisites: basic courses in biology (preferably neurobiology) and chemistry. SPRING [4] Casagrande.

347. The Visual System. (Also listed as Neuroscience 347, Psychology 336, Electrical and Computer Engineering 351) An interdisciplinary approach to how humans see and interpret their visual environment. Topics include the structure of the eye and brain (including optics), the physiology of individual cells and groups of cells, machine vision and models of visual function, visual attention, and mechanisms of complex visual perception. Lectures by faculty from Psychology, Engineering, and Cell 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] Casagrande, Bonds (Electrical and Computer Engineering), Powers (Psychology).

348. Histology for Research. (Also listed as Cellular and Molecular Pathology 348) This course is designed to provide students with sufficient background in normal histology to enable an understanding of pathologic changes that occur as a consequence of genetic or other experimental manipulations. Lectures will cover normal structure and function of basic tissues and major organ systems. The laboratory will emphasize proficiency in comparative microscopic analysis of human and animal model tissues. A microscope rental fee is required. FALL. [3] Staff (Cell Biology), Swift (Pathology).

352. Current Topics in Neurochemistry and Psychopharmacology. Biochemical mechanisms as they relate specifically to nervous tissue. Major emphasis on studies concerned with neurotransmitter systems. The morphological and molecular neurobiological aspects of neurochemical transmission, as they relate to the effect of drugs on CNS systems, are emphasized. Prerequisite: a background in biochemistry and consent of instructor. SPRING. [2] Burt.

369. Master's Thesis Research.

399. Ph.D. Dissertation Research.

Cellular and Molecular Pathology

CHAIR Doyle G. Graham
DIRECTOR OF GRADUATE STUDIES Larry L. Swift

PROFESSORS Raymond F. Burk, Robert D. Collins, Jeffrey Mark Davidson, Doyle G. Graham, Richard L. Hoover, Barbara O. Meyrick-Clarry, William M. Mitchell, Harold L. Moses, David L. Page, Fritz F. Parl, F. James Primus, Larry L. Swift, William O. Whetsell, Jr., Stephen C. Woodward

ASSOCIATE PROFESSORS James B. Atkinson III, Paul E. Bock, Robert C. Briggs, Sergio Fazio, Agnes B. Fogo, Susan A. Halter, Michael A. Haralson, Jeffrey T. Holt, Roy Andrew Jensen, Joyce E. Johnson, Mahlon D. Johnson, Thomas L. McCurley III, Kevin G. Osteen, Gregory C. Sephel, Virginia L. Shepherd, Charles W. Stratton, Cindy L. Vnencak-Jones

RESEARCH ASSOCIATE PROFESSOR Venkataraman Amarnath

ASSOCIATE CLINICAL PROFESSOR Myron A. Holscher

ASSISTANT PROFESSORS David Gailani, Thomas J. Montine, James O. Price, Scott B. Shappell, William M. Valentine

RESEARCH ASSISTANT PROFESSOR Kalyani Amarnath

DEGREES OFFERED: *Master of Science, 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 preclinical and clinical disciplines. It seeks to determine the etiology of disease, to study the agents and conditions that cause disease, and to trace 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 which 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. 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. The research interests of the faculty include vascular biology, tumor biology, neurobiology and neuropathology, the immune response, inflammation and repair, the biology of the extracellular matrix in response to disease processes, the pathogenesis of infectious agents, the regulation of gene expression in disease, and the role of environmental pathogens in disease. The department is fully

equipped with modern research training facilities and provides close faculty supervision through a high faculty-to-student ratio.

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] Swift and Staff.

323. Surgical Pathology. This course is designed to complement Cellular and Molecular Pathology 351 by presentation of selected diseases in greater depth. Topics include surgical pathology of soft tissues and bone, salivary glands, organs of special sense, and genitourinary tract. Clinicopathology correlation is emphasized by demonstration of surgical specimens and class discussion. FALL, SPRING. [1] Page.

324. Animal Models of Disease and Diseases of Laboratory Animals. Etiology, clinical findings, pathogenesis, gross and microscopic lesions of selected diseases of domestic and laboratory animals. Emphasis on those diseases that closely resemble similar disease processes in humans and their value as experimental models. Prerequisite: 351 or prior approval. SPRING. [2] Holscher and Staff.

327. Pathology and Pathogenesis of Neurological Disease. The neuroanatomical and neuropathophysiological aspects of nervous system disease with emphasis on mechanisms and neuropathological characteristics. Prerequisite: 351. FALL. [1] Whetsell.

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. [1] Fazio, Linton, Swift.

331. Seminar in Experimental Pathology. Students, residents, and fellows present joint seminars correlating advances in basic research with clinical manifestations of selected diseases. FALL. [1] Briggs and Staff.

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

333. Fundamentals of Communication for Investigative Pathology. 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. FALL. [3] Bock, Hoover, and Staff.

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

337. Cellular and Molecular Basis of Vascular Disease. Lectures on contemporary research in cell biology, protein and lipid biochemistry, and molecular biology of the vascular system. Open to graduate and medical students, postdoctoral fellows, and undergradu-

ate students with consent of instructors and Dean for Graduate Studies and Research. Prerequisite: a suitable background in biochemistry and cell biology. SPRING. [3] Bock, Hoover.

342. Cancer Biology. (Also listed as Cell Biology 342 and Microbiology and Immunology 342) A multidisciplinary course that emphasizes concepts of basic carcinogenesis and molecular mechanisms. Employs pathologic specimens and patient presentations to illustrate the application of science to the study of human disease. SPRING. [4] Jensen, Matrisian (Cell Biology). Ruley (Microbiology & Immunology).

348. Histology for Research (Also listed as Cell Biology 348). This lecture and laboratory course is designed to provide students with sufficient background in normal histology to enable an understanding of pathologic changes that occur as a consequence of genetic or other experimental manipulations. Lectures will cover normal structure and function of the basic tissues and major organ systems. The laboratory will emphasize proficiency in comparative microscopic analysis of human and animal model tissues. A microscope rental fee is required. FALL. [3] Swift, Hoffman (Cell Biology).

351. Cellular and Molecular Basis of Pathology. An introduction to the morphology and pathogenesis of disease, with emphasis on alterations of normal cellular, molecular, and biochemical processes and on recent developments in our understanding of disease. Lectures, review of normal histology, small group discussions, and laboratory work. Prerequisites include a basic knowledge of biochemistry, cell, and molecular biology. SPRING. [4] Sephel and Staff.

352. Clinicopathologic Correlations in Neuropathology. An overview of human neurological disease will be pursued via case-based learning focused on the clinical and pathological manifestations. A different disease will be studied each week using the format of a clinicopathologic correlation (CPC). Prerequisite: 351. SPRING [2] Montine.

355. Mammalian Target Organ Toxicology. The morphologic, physiologic, and biochemical properties of organ systems responsible for unique susceptibilities to xenobiotics and the mechanisms through which specific agents act on these properties to perturb normal biological functions will be covered using classical and contemporary examples. SPRING [2] Valentine.

399. Ph.D. Dissertation Research.

Chemical Engineering

CHAIR M. Douglas LeVan
DIRECTOR OF GRADUATE STUDIES G. Kane Jennings
PROFESSOR EMERITUS Thomas M. Godbold
PROFESSORS Robert J. Bayuzick, Tomlinson Fort, Thomas R. Harris, M. Douglas LeVan, Knowles A. Overholser, Robert J. Roselli, John A. Roth, Karl B. Schnelle, Jr., Robert D. Tanner
RESEARCH PROFESSOR Ales Prokop
ASSOCIATE PROFESSORS Kenneth A. Debelak, Todd D. Giorgio

RESEARCH ASSOCIATE PROFESSOR William H. Hofmeister
ASSOCIATE PROFESSOR OF THE PRACTICE Julie Ervin Sharp
ASSISTANT PROFESSORS R. Robert Balcarcel, Frank M. Bowman, G. Kane Jennings,
    Bridget R. Rogers

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

❧ GRADUATE work in chemical 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 for the Ph.D. essentially doubles the exposure to chemical 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 includes problems in six broad areas: Adsorption and Surface Chemistry; Biochemical Engineering and Biotechnology; Chemical Reaction Engineering; Environment; Materials; Process Modeling and Control.

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, 6 hours in a minor field complementary to the research, and 6 hours in chemical engineering and related areas). 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. Person interested in this program should contact the Director of Graduate Studies in Chemical 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 36 of these hours are course work (24 hours in chemical engineering graduate courses and 12 hours in minor and related fields). 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. The M.S. degree may be waived as a requirement for Ph.D. study upon approval of the faculty. 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 engineering core courses. 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. An examination in the minor field may also be given. Following the examinations and at least 24 semester hours of dissertation research, the student prepares and publicly defends a dissertation presenting results of original research in chemical engineering.

225. Kinetics. 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. A brief treatment of catalysis and physical and chemical adsorption is given. Graduate credit for nonmajors. Prerequisite: 223, Chemical and Phase Equilibria and Chemistry 231. FALL. [3] Bowman.

230. Introductory Transport Phenomena. The principles of mass, momentum, and energy transport and their application to analysis and design of engineering systems. Graduate credit for nonmajors. Prerequisite: consent of instructor. Corequisite: Math 229. FALL. [3] Jennings.

231 Rate-Based Transport Operations. Principles and techniques of chemical engineering practice and design. Analysis of chemical engineering processes involving mass transfer, heat transfer, and fluid mechanics. Consideration of safety in the context of process equipment design. Prerequisite: ChE 230 or consent of instructor. SPRING. [3].

232. Separation Processes. Chemical engineering design and practice of chemical separation processes which reach or approach equilibrium. These processes include distillation, adsorption, and extraction. Process simulation of separation processes is required. Consideration of safety and economics in the context of process and equipment design. Prerequisite: ChE 230 or consent of instructor. SPRING [3].

233W. Chemical Engineering Process Design. A capstone design course for chemical engineering students. A systematic approach to design and safety practices for chemical process operations. The course involves process design, economic evaluation of alternatives, and a cost and safety analysis of a typical chemical or petroleum process. The use of process simulations is required. A comprehensive design report is required. Prerequisite: 232 and 216 or consent of instructor. SPRING [4] Debelak.

242. Chemical Process Control. Design of control systems for chemical processes. Principles of process dynamics and control of single and multivariable systems. Frequency and stability analyses and their effect on controller design. Graduate credit for nonmajors. Prerequisite: Math 229. SPRING. [3] LeVan.

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

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

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

310a. Applied Mathematics in Chemical Engineering I. Chemical engineering applications of advanced methods of mathematics, such as Laplace transforms, calculus of finite differences, and numerical methods, with emphasis on expressing physical situations in mathematical language together with methods used in analysis of experimental data. [3] (Offered on demand)

310b. Applied Mathematics in Chemical Engineering II. A continuation of 310a. [3] (Offered on demand)

311a–311b. 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; and other special advanced topics relevant to chemical engineering. 311a, SPRING; 311b offered on demand. [3–3] Schnelle.

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

312b. Transport Phenomena II. A continuation of 312a. SPRING. [3] Staff.

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

314. Stagewise Operations. Stagewise operations, such as distillation, absorption, and extraction, with special emphasis on multi-component systems. SPRING. [3] Tanner.

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

317. Physiological Transport Phenomena. (Also listed as Biomedical Engineering 317) The quantitative description of momentum transport (viscous flow) and mass transport (convection and diffusion) in living systems. Prerequisite: courses in fluid dynamics and mass transfer. [3] (Not currently offered)

320. Surfaces and Adsorption. (Also listed as Materials Science and Engineering 320) Surface energy, capillarity, contact angles and wetting, surface films, insoluble monolayers, solid surfaces, membranes, surface area determination, adsorption, adhesion, interface thermodynamics, friction and lubrication, interfaces in composites, relationships of surface to bulk properties of materials. FALL. [3] Fort.

325. Polymer Science and Engineering. (Also listed as Materials Science and Engineering 325) Macromolecular systems, with emphasis on the interrelationship of chemical, physical, and engineering properties and the further relation of these properties to synthesis and application. A basic understanding of organic chemistry and of physical chemistry is assumed. SPRING. [3] Staff.

334. Advanced Reaction Kinetics. The optimum design of chemical reactors and modern topics in engineering kinetics. [3] (Offered on demand)

352. Advanced Physical/Chemical Wastewater Treatment. (Also listed as Environmental Engineering 352) The theory of mass transfer and chemical reactor technology in advanced wastewater treatment design; physical/chemical processes in municipal and industrial wastewater treatment; evaluation of process alternatives for cost effectiveness. Prerequi-

site: CE 211, Water and Waste Water Treatment or consent of instructor. SPRING. [3] Roth, Bowers (Environmental and Water Resources Engineering).

369. Master's Thesis Research. [0]

397. Special Topics. FALL. [3]

398. Seminar. [0]

399. Ph.D. Dissertation Research.

Chemistry

CHAIR David M. Hercules
DIRECTOR OF GRADUATE STUDIES Charles M. Lukehart
PROFESSORS EMERITI Robert V. Dilts, Larry C. Hall, Melvin D. Joesten, Mark M. Jones,
    Donald E. Pearson, Howard E. Smith, John R. Van Wazer, David J. Wilson
PROFESSORS Richard Armstrong, Richard M. Caprioli, Thomas M. Harris,
    David M. Hercules, B. Andes Hess, Jr., Charles M. Lukehart, Lawrence J. Marnett,
    Prasad L. Polavarapu, Ned A. Porter, Lawrence J. Schaad, Joel Tellinghuisen
ADJOINT PROFESSOR Lidia Smentek
ASSOCIATE PROFESSORS Timothy P. Hanusa, Carmelo J. Rizzo, Michael P. Stone, David
    L. Tuleen
RESEARCH ASSOCIATE PROFESSOR Constance M. Harris
ASSISTANT PROFESSORS John M. Desper, Piotr Kaszynski, Tingyu Li,
    Sandra J. Rosenthal
ADJOINT ASSISTANT PROFESSOR Andrienne C. Friedli
SENIOR LECTURER Shawn T. Phillips

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

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

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

202. Introduction to Bioinorganic Chemistry. Functions of inorganic elements in living cells. The manner in which coordination can modify the properties of metallic ions in living systems. Non-metallic elements including selenium, iodine, chlorine, and phosphorus. Prerequisite: 220a–220b. [3] (Not currently offered)

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

204. Inorganic Preparations. Techniques used in inorganic synthesis are emphasized; one or two laboratories per week. Pre- or corequisite: 203. SPRING. [Variable credit; 1–2 each semester] (Not currently offered)

207. Introduction to Organometallic Chemistry. A general survey of the preparation, reaction chemistry, molecular structure, bonding, and spectroscopic identification of organometallic compounds of the transition metals. Prerequisite: 220a–220b. FALL. [3] Lukehart.

210. Analytical Chemistry I. Fundamental quantitative analytical chemistry, with emphasis on principles and methods of separation, on equilibria, and on stoichiometry. No credit for graduate students in chemistry. Two lectures and two laboratory periods per week. SPRING. [4] Li.

211. Analytical Chemistry II. Chemical and physical principles of modern analytical chemistry with emphasis on instrumental techniques. No credit for graduate students in chemistry. Prerequisite: 210, 220a-220b, and 230. Two lectures and two laboratory periods per week. FALL. [4] Stone.

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

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

220c. Organic Chemistry: Structure and Mechanism. Advanced topics in organic chemistry and applications to biological sciences. Stereochemistry and conformational analysis, mechanisms of organic, bioorganic and enzymatic reactions, linear free-energy relationships, reactive intermediates. SPRING. [3] Rizzo.

221. Laboratory Techniques in Organic Chemistry. Advanced work in organic preparations, new synthetic techniques, and modern organic analytical methods, including infrared and nuclear magnetic resonance. Prerequisite: 220b. One lecture and two laboratory periods per week. FALL. [3] Harris.

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

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

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

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

226. Medicinal Chemistry. Drug design and development; drug interactions with receptors, enzymes, and DNA; selected therapeutic areas. Some organic synthesis. No credit for chemistry graduate students. Prerequisite: 220a–220b. [3] (Not currently offered)

230. Physical Chemistry I. Chemical thermodynamics, chemical equilibrium, and chemical kinetics. Prerequisite: Math 171a–171b or Math 172a–172b. Credit is not given for both 200 and 230. No credit for graduate students in chemistry. FALL. [3] Tellinghuisen.

231. Physical Chemistry II. Electrochemistry, kinetic molecular theory, advanced chemical kinetics, and reaction mechanisms. Prerequisite: 230, Physics 117a–117b, and Math 222 or 221a–221b. No credit for graduate students in chemistry. SPRING. [3] Tellinghuisen.

232. Quantum Chemistry and Spectroscopy. Principles of quantum chemistry applied to molecular structure, bonding, and spectroscopy. Prerequisite: 230, Physics 117a–117b, and Math 222 or Math 221b. FALL. [3] Rosenthal.

235. Surface and Polymer Chemistry. Spectroscopic methods for studying surfaces, with emphasis on polymer systems. Prerequisite: 230. [3] (Not currently offered)

236. Physical Chemistry I Laboratory. One three-hour laboratory per week. Experiments in chemical thermodynamics, chemical equilibrium, and chemical kinetics. Normally taken concurrently with 230. No credit for graduate students in chemistry. FALL. [1] Tellinghuisen.

237. Experimental Spectroscopy. Experiments in ultraviolet, visible, infrared, Raman, and magnetic resonance spectroscopy, with application to lasers, photochemistry, and kinetics. No credit for graduate students in chemistry. One three-hour laboratory and one lecture per week. Prerequisite: 230 and 236. SPRING. [2] Tellinghuisen.

238. Data Analysis. Probability and experimental error in physical science. Statistical methods, with emphasis on the method of least squares. Applications in physical and analytical chemistry. Prerequisite: 230. [1] Tellinghuisen. (Not currently offered)

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

301a–301b. Chemistry Seminar. [1–1] Staff.

304. Special Topics in Inorganic Chemistry. SPRING. [3] Hanusa.

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

311. Advanced Analytical Chemistry. Data analysis and experimental design, solution equilibria, mass spectrometry, and atomic spectrometry. SPRING. [3] Hercules.

312. Electrochemistry: Theory and Analysis. FALL. [3] (Not currently offered)

314a–314b. Special Topics in Analytical Chemistry. [1–3] (Not currently offered)

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

323. Stereoisomerism and Structure Theory. Three lectures per week. [3] (Not currently offered)

324. Special Topics in Organic Chemistry. [3] Rizzo. (Not currently offered)

326. Readings in Organic Chemistry. Current topics in organic literature. May be repeated for a total credit of 3 hours. Prerequisite: 222 or 223. [1–1] Organic chemistry faculty. (Not currently offered)

330a. Quantum Chemistry I. Limits of classical mechanics at the atomic and molecular level; the postulates of quantum mechanics applied to problems in one, two, and three dimensions; perturbation and various methods. Prerequisite: 232 and Math 223ab or Math 222–229. SPRING. [3] Polavarapu.

330b. Quantum Chemistry II. Advanced topics in the application of quantum mechanics to chemical bonding and spectroscopy. Prerequisite: 330a. [3] (Not currently offered)

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. SPRING. [3] Posey.

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

334a–334b. Special Topics in Physical Chemistry. Pre- or corequisite: 330a. [3–3] Polavarapu. (Not currently offered)

335. Chemical Dynamics. Chemical reactions from thermodynamics of equilibrium systems to theories of reaction rates. Application to reactions in condensed phase, on surfaces, and in biological systems. FALL. [3] Schaad.

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

340. Applications of Group Theory. Molecular symmetry, point groups, and character tables. Application to molecular orbitals, vibrational spectra, organic and inorganic systems. [3] Polavarapu. (Not currently offered)

369. Master's Thesis Research.

399. Ph.D. Dissertation Research. Staff.

Chinese

SENIOR LECTURER Xianmin Liu
LECTURER Sheldon Shih-Tsun Ma

❧ COURSES in Chinese are available for minor credit in master's degree programs only. Students should consult their advisers about the acceptability of the courses as related work.

201–202. Intensive Modern Chinese. An intensive introduction into the structure of modern Mandarin and aural comprehension of the spoken language. [5–5] Staff.

214–216. Second-Year Chinese. Emphasis on reading. Also included are syntax, writing, translation, and conversation. Prerequisite: 201–202. [5–5] Staff.

231a–231b. Chinese Calligraphy. Introduction to Chinese writing, with instruction in stroke order and the principles of character structure. Students are given the opportunity to practice writing with a Chinese brush to develop the traditional style of producing Chinese characters. Prerequisite: one year of Chinese or Japanese. [1–1] Ma.

241–242. Third-Year Chinese. Readings in contemporary Chinese. Prerequisite: 211–212 or 221–222. [3–3] Staff.

251–252. Fourth-Year Chinese. Readings in advanced Chinese historical, cultural, and literary texts. Prerequisite: 241–242. [3–3] Staff.

289a–289b. Independent Study. A reading course, the content of which varies according to the need of the individual student. Primarily designed to cover pertinent material not otherwise available to the student in the regular curriculum. [Variable credit: 1–3] Staff.

Civil Engineering

CHAIR Edward L. Thackston
DIRECTOR OF GRADUATE STUDIES Edward L. Thackston
PROFESSOR EMERITUS Paul Harrawood
PROFESSORS Mark David Abkowitz, Prodyot K. Basu, Peter G. Hoadley, Frank L. Parker,
    Richard E. Speece, Edward L. Thackston
ASSOCIATE PROFESSORS Alan Ray Bowers, Guillermo Hahn, Sankaran Mahadevan,
    Robert E. Stammer, Jr.
ASSOCIATE PROFESSOR OF THE PRACTICE John R. Veillette
ASSISTANT PROFESSORS Hector Estrada, Eugene Le Boeuf, Lori Troxel
ADJUNCT ASSISTANT PROFESSOR Darlene Reiter
ADJUNCT INSTRUCTOR Charles Higgins

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

❧ DEGREE programs at the M.S. and Ph.D. level are offered in structural engineering, structural mechanics, and transportation engineering. 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 48 hours of formal course work, including at least 12 hours of minor work in a separate but related field, and a dissertation. A total of 24 hours of graduate-level course work and a research thesis is required for the M.S. degree.

There is no foreign language requirement.

The Master of Engineering degree, an advanced professional degree for engineers, is offered by the School of Engineering.

243. Soil Mechanics. Study of origin, formation, classification, identification, and engineering properties of soils. Discussions on index properties, soil moisture, soil structure, compressibility, shear strength, stress analysis, lateral pressures, and foundation capacities. Graduate credit for geology majors. Prerequisite: 182, Mechanics of Materials or consent of instructor. FALL. [3] Hoadley.

255. Transportation System Design. The geometric analysis of transportation ways, with particular emphasis on horizontal and vertical alignment. Design of highways, interchanges, intersections, and facilities for air, rail, and public transportation. Prerequisite: 225, Transportation Systems Engineering. SPRING. [3] Stammer.

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

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

258. Environmental Analysis in Transportation Systems. Assessment of environmental impacts of proposed transportation projects, including analytical modeling techniques for noise and air quality. The role of environmental analysis in the project development process, including pertinent laws and regulations, is addressed. FALL. [3] Reiter.

275. Environmental Risk Management. (Also listed as Management of Technology 265) Development of environmental safety programs for technological operations. Focus on defining an environmental risk management process and program implementation, performing risk assessments, determining and selecting appropriate risk reduction strategies, and influencing risk management decisions internally and externally. Extensive use of case studies drawn from the chemical and energy-producing industries. SPRING. [3] Abkowitz.

276. Ground Water 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. SPRING. [3] Le Boeuf.

279. Economics and Law of Air and Water Resources. Economics of air and water resource conservation and development, water rights, public policy and laws relating to air and water resources. SPRING. [3] Parker, Thackston.

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

285. Foundation Analysis and Design. Shallow and deep foundation elements and systems for civil engineering structures. Prerequisite: 243 or equivalent. SPRING. [3] Hoadley.

286. Earth Pressures and Retaining Structures. Lateral earth pressures. Analysis and design of retaining structures. Prerequisite: 243 or equivalent. FALL. [3] Hoadley.

293. Advanced Structural Steel Design. Behavior, structural planning and design of steel structural systems. Design of plate girders, columns undergoing lateral-torsional and local buckling, and composite beams and columns. Highway bridge classification, AASHTO loading, and LRFD of beam-and-slab type bridges. Plastic analysis of beams and frames. Fatigue design of tension members under cyclic loads. Design of multistory and industrial buildings including connections to transmit moment, shear and axial forces. Design of members for combined torsion and flexure-crane runway girder. Computer applications. Prerequisite: CE 233 or equivalent. FALL. [3]

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: 234, Reinforced Concrete Design. SPRING. [3] Troxel.

295. Mechanics of Composite Materials. Review of constituent materials (reinforcements, matrices, and interfaces) and fabrication processes. Prediction of properties of unidirectional and short fiber materials (micromechanics). Anisotropic elasticity (derivation of Hooke's law for anisotropic materials, macromechanics of laminated composites). Analysis of laminated composites based on Classical Lamination Theory. Behavior of composite beams and plates. Special topics (creep, fracture, fatigue, impact, and environmental effects). Prerequisite: CE 182 and MSE 150. SPRING. [3] Estrada.

299. Special Topics. Special topics of interest to staff and students based on departmental research or current developments in civil engineering. FALL, SPRING. [3] Staff.

301. Advanced Mechanics of Solids I. Stress and strain analysis: equilibrium, compatibility, and constitutive equations including linear elastic and thermo-elastic relations; transformations; octahedral and deviatoric stresses. Applications to the torsion of bars, stress concentrations, and semi-infinite medium problems. Euler-Bernoulli and Timoshenko beam theories. Energy and related methods including applications. Kirchoff's bending of rectangular and circular plates. Prerequisite: CE 182 or equivalent, Math 198 or equivalent, Math 194 or equivalent, or consent of instructor. FALL. [3] Hahn.

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] Basu.

304. Theory of Shell Structures. Analysis of general shells and shells of revolution under various loading and boundary conditions, considering both analytical and numerical solutions. Stability and vibration characteristics of shells. Prerequisite: 302. [3] (Offered on demand)

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] Basu.

309. Structural Dynamics. Analysis of single and multidegree of freedom systems. Modal superposition method. Time and frequency domain analyses. Numerical methods and introduction to nonlinear dynamic analysis. Applications to structures subject to earthquake and impact forces. Introduction to random vibrations. Prerequisite: 301 or consent of instructor. SPRING. [3] Hahn.

310. Probabilistic Models in Engineering Design. Applications of probabilistic models in the analysis and synthesis of engineering systems. Review of basic probability concepts, random variables and distributions, modeling and quantification of uncertainty, testing the validity of assumed models, linear regression and correlation analyses, Monte Carlo simulation, reliability analysis and reliability-based design. Emphasis on applications in civil, mechanical, and chemical engineering. Prerequisite: Math 230 or consent of instructor. FALL. [3] Mahadevan.

311. Synthesis of Structural Systems. Methods for optimal design of mechanical systems are developed and applied. Nonlinear optimization strategies are implemented through progressive exercises on unconstrained and constrained optimization problems with single and multiple design variables. Students explore the implementation of basic algorithms through computer-based tools and available Fortran (or C) subroutines. Feasibility and optimality conditions and design problem formulation are emphasized. Computer literacy and some programming experience are required. Each student is expected to complete a major design project in their area of technical interest. SPRING. [3]

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]

317. Stability of Structures. Buckling analysis of perfect and imperfect columns, mathematical treatment of various stability problems and stability criteria, dynamic and static instability, energy methods. Buckling of frames, trusses, beam-columns, rings, and tubes. [3] Basu. (Offered on demand)

325a–325b. Individual Study of Civil Engineering Problems. Literature review and analysis of special problems under faculty supervision. [Variable credit: 1–4 each semester]

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

353. Airport Planning and Design. Integration and application of the principles of airport master planning from the beginning stages of site selection through actual design of an airport facility. Specific study topics address demand forecasting, aircraft characteristics, capacity analyses, and geometric design of runways, terminals, and support facilities. Prerequisite: 225, Transportation Systems Engineering, or consent of instructor. [3] (Offered on demand)

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: 255. SPRING. [3] Stammer.

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

357. Theory of Traffic Flow. Traffic flow from the perspective of probability as applied to highway, intersection, and weaving capacities. Discrete and continuous flow, vehicle distributions, queuing, and simulation. Prerequisite: 257. [3] (Offered on demand)

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 in transportation or manufacturing operations, or consent of instructor. FALL. [3] Abkowitz.

369. Master's Thesis Research. [0]

399. Ph.D. Dissertation Research.

Classical Studies

CHAIR Susan Ford Wiltshire
DIRECTOR OF GRADUATE STUDIES F. Carter Philips
PROFESSORS Robert Drews, Susan Ford Wiltshire
ASSOCIATE PROFESSORS Thomas A. J. McGinn, F. Carter Philips, Barbara Tsakirgis
ASSISTANT PROFESSORS Christopher M. Brunelle, Kathy L. Gaca
SENIOR LECTURER Daniel P. Solomon

DEGREES OFFERED:

CLASSICS. *Master of Arts, Doctor of Philosophy*

LATIN. *Master of Arts in Teaching*

❧ THE department maintains a small and select graduate program. The M.A. program enables students either to become Latin teachers in secondary schools or to prepare themselves for admission to a Ph.D. program. Upon entering the M.A. program a student should be able to read Greek and Latin at an advanced undergraduate level, and should also have begun the study of either French or German. The program requires 36 hours of course work, some of which may be taken in closely related fields outside the department such as philosophy, religious studies, comparative literature, history, or art history. The program also requires the writing of an M.A. paper, and the passing of proficiency examinations in Greek, Latin, history, art and archaeology, and a modern foreign language.

An M.A.T. program (Master of Arts in Teaching) is offered by the department in conjunction with Peabody College. The degree requires 18 hours of course work in Latin or closely related subjects (ancient history, art and archaeology, Greek), in addition to 18 hours of course work in education. For certification, 29 hours in education are currently required. Tennessee certification is reciprocal with 26 states.

In appropriate circumstances the department accepts applicants finishing an M.A. degree into its Ph.D. program. Such applicants must be highly qualified and highly motivated, capable of progressing to professional competence in a program in which seminars are necessarily complemented by extensive independent study. It is expected that all students in the M.A. and Ph.D. programs will enroll in all departmental seminars; normally four seminars are offered annually.

As in all of its graduate programs, the department encourages breadth rather than specialization for Ph.D. candidates. These students should acquire familiarity with classical antiquity as a whole: history, literature, philosophy and religion, art and architecture. In addition, students are invited to acquire an elementary acquaintance with one or more related fields, such as the ancient Near East, early Christianity, medieval history, Roman law, Greek and Roman social history, or the classical tradition in

America. Courses on these subjects, whether offered in this department or in other programs of the Graduate School, may be used to satisfy degree requirements.

Greek

201. Beginning Greek I. (Formerly 101). The elements of classical Greek. Reading of simplified texts from authors of the fifth and fourth centuries B.C. FALL [4] Gaca.

202. Beginning Greek II. (Formerly 102). Continuation of 201. Completion of the elements of classical Greek through readings from classical authors. Introduction to Homeric and Hellenistic Greek. Prerequisite: 201 or departmental placement. SPRING. [4] Gaca.

203. Intermediate Greek I: Classical and Koiné Greek. Review of Greek grammar, and reading from classical and biblical texts. Prerequisite: 202. FALL. [3] Philips.

204. Intermediate Greek II: Homer's *Iliad.* Selected reading and interpretation; history and literary characteristics of the Homeric epic; practice in reading of meter. Prerequisite: 203. SPRING. [3] Philips.

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. FALL. [3] Drews.

215. The Greek Tragedians. Selections from the plays of Aeschylus, Sophocles, and Euripides. Survey of the development of tragedy. Prerequisite: 204. [3] Philips, Wiltshire. (Offered 2000/01)

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] Gaca. (Offered 2000/01)

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] Philips. (Not currently offered)

240. The Gospels in Greek. Matthew and selections from the other Gospels. Prerequisite: 203 or departmental placement. [3] (Not currently offered)

277. Readings in Greek Philosophy. Selected readings from the dialogues of Plato and from the ethical writings of Aristotle. Corollary readings and discussion of the pre-Socratic and post-Aristotelian schools. Paper and reports required. Prerequisite: 3 hours above 204. [3] (Not currently offered)

289. Independent Study. Designed for majors wanting to familiarize themselves with works and authors not covered in the regular curriculum. Prerequisite: 6 hours above 204. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed a total of 6]

313. Seminar in Classical Greek Prose. May be repeated for credit with change of subject matter. [3] (Offered 2000/01)

314. Seminar in Classical Greek Poetry. May be repeated for credit with change of subject matter. [3] (Offered 2000/01)

320. Seminar in Early Greek Poetry. SPRING. [3] Philips.

Latin

101G. Latin Reading Course for Graduate Students. One semester survey of grammar and vocabulary coupled with extensive reading and exercises. Available to graduate students for "no credit" only. Three hours per week. [0] (Not currently offered)

201. Catullus and Horace. Reading and interpretation of the `Carmina` of Catullus and the `Odes` of Horace. Prerequisite: 104 or departmental placement. [3] (Offered 2000/01)

202. Ovid. Reading and interpretation of selections from the `Metamorphoses` or other works of Ovid. Prerequisite: 104 or departmental placement. [3] (Offered 2001/02)

206. Cicero and the Humanistic Tradition. Study of Cicero's career and thought, and of his contribution to the development of the concept of `humanitas`. Readings from his letters, speeches, and philosophical works. Prerequisite: 104 or departmental placement. [3] (Offered 2001/02)

212. Roman Comedy. Reading of selected comedies of Plautus and Terence; study of the form of Roman comedy and its relation to Greek New Comedy. Prerequisite: 104 or departmental placement. [3] (Offered 2000/01)

215. The Roman Historians. Selections from Sallust, Livy, and Tacitus, with attention to their objectives and methods; analysis of Roman historiography and its relation to Greek and early Christian historiography. Prerequisite: 104 or departmental placement. FALL. [3] Brunelle.

220. Vergil: *The Aeneid.* An intensive study of the entire poem, in the context of the epic tradition. Prerequisite: 104 or departmental placement. [3] Wiltshire. (Offered 2000/01)

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] (Offered 2001/02)

264. Roman Satire. The satires of Horace and Juvenal; the origins of Roman satire; history and conventions of the genre; background reading in other Roman satirists. Prerequisite: 3 hours above 104, Intermediate Latin II. [3] McGinn. (Not currently offered)

268. Lucretius: *De Rerum Natura.* Lucretius' poem studied both in the tradition of Epicurean philosophy and as a landmark in the development of the Latin didactic epic; background material in the fragments of Epicurus and some treatment of the Epicurean movement in Italy and especially in Rome. Prerequisite: 3 hours above 104, Intermediate Latin II. [3] Wiltshire. (Offered 2001/02)

289. Independent Study. Designed for majors wanting to familiarize themselves with works or authors not covered in the regular curriculum. Prerequisite: 6 hours above 104, Intermediate Latin II. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed a total of 6]

313. Seminar in Classical Latin Prose. May be repeated for credit with change of subject matter. SPRING. [3] Brunelle.

314. Seminar in Classical Latin Poetry. May be repeated for credit with change of subject matter. FALL. [3] Wiltshire.

Classics

Courses below the 300 level require no knowledge of either Greek or Latin.

203. Aegean Art and Archaeology of the Bronze Age. (Also listed as Fine Arts 203) The art and archaeology of the major cultures around the Aegean Sea between 3000 and 1000 B. C.: Minoan, Helladic or Mycenaean of the Greek mainland, Cycladic and those of Anatolia. No credit for students who have completed 223. No credit for students who have completed 223. [3] (Offered 2001/02)

204. Archaic and Classical Greek Art and Architecture, 1000 to 400 B.C. (Also listed as Fine Arts 204) 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. FALL. [3] Tsakirgis.

205. Late Classical Greek and Hellenistic Art and Architecture. (Also listed as Fine Arts 205) Sculpture, vase painting, architecture, and the minor arts from after the Parthenon to the Roman Empire. A focus on those media (wall painting and mosaic) which develop significantly in this period. SPRING. [3] Tsakirgis.

206. Roman Art and Architecture. (Also listed as Fine Arts 206) 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. SPRING. [3] Tsakirgis.

207. History of the Ancient Near East. (Also listed as History 207) 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] Drews. (Offered 2000/01)

208. History of Greece, to Alexander the Great (Formerly 208a; also listed as History 208) 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. FALL. [3] Drews.

209. Greece and the Near East from Alexander to Theodosius (Formerly 208b; also listed as History 209) 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] Drews, Gaca. (Offered 2000/01)

210. Ancient Philosophy. (Also listed as Philosophy 210) An examination of the major Greek and Roman philosophers with emphasis on the works of Plato and Aristotle. FALL. [3] Teloh (Philosophy).

211. The Greek City. The example of ancient Athens. The stoa, the theater, the house, and fortifications. Institutions such as the courts, the public assembly, and the family. Literary, historical, archaeological, and philosophical sources. [3] Tsakirgis. (Offered 2000/01)

212. History of the Roman Republic. (Also listed as History 210) The growth and evolution of the Roman world, from the foundation of the city in the seventh century B.C. to the reign of Caesar Augustus. The Romans' unification of Italy, conquest of the Mediterranean and western Europe, adoption of Hellenism, and overthrow of the Republic. No credit for students who have had the former 209 (History of Rome). FALL. [3] Drews

213. History of the Roman Empire. (Also listed as History 211) The Roman world from Augustus to the collapse of the western empire in the fifth century. Political, military, social and religious history. Special attention given to problems arising from use of the primary sources as well as to controversies in modern scholarship. No credit for students who have had the former 209 (History of Rome). SPRING. [3] McGinn.

217. Art and Architecture of Egypt and the Ancient Near East. (Also listed as Fine Arts 217) A survey of the art and architecture of Egypt from the fourth millennium B.C. through the Old, Middle, and New Kingdoms, and a survey of the art and architecture of the major cultures of the ancient Near East from the fourth millennium to the late sixth century B.C.,

including the Sumerians, Assyrians, Hittites, and Babylonians. Emphasis on sculpture, wall painting, architecture, and the minor arts. FALL. [3] Tsakirgis.

218. Hellenistic and Late Ancient Philosophy. (Also listed as Philosophy 218) Philosophical ideas of Stoics, Cynics, Epicureans, skeptics, Peripatetics, Neoplatonists, and early monotheist thinkers such as Philo, Origen, and Philoponus. [3] Goodman. (Not currently offered)

220. Women, Sexuality, and the Family in Ancient Greece and Rome. The status and role of women, law and the regulation of the private sphere, sexuality and gender role, demography and family structure, marriage, children, religion, domestic architecture and the household economy, ancient critiques of the family, and the impact of Christianity. [3] McGinn. (Not currently offered)

222. Classical Tradition in America. (Also listed as American and Southern Studies 222) 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] Wiltshire. (Offered 2000/01)

305. Seminar in Classical Art and Architecture. (Also listed as Fine Arts 305) May be repeated for credit with change of subject matter. [3] Tsakirgis. (Offered 2000/01)

309. Seminar: Studies in Ancient History. May be repeated for credit with change of subject matter. [3] (Not currently offered)

369. Master's Thesis Research. [0]

398. Independent Study. An individual reading and study program on an author or area of classical antiquity not treated in the regular curriculum. No formal instruction is given, but the student's work is supervised and evaluated by one or more members of the staff. Up to 12 hours of 398 may be earned, but no more than 3 hours in any one semester. Open only to students who have completed one year of graduate study in classics. FALL, SPRING. [Variable credit: 1–3]

399. Ph.D. Dissertation Research.

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

Comparative Literature

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

❧ THE program in comparative literature is offered under supervision of the Committee on Humanities and Comparative Literature: Margaret Anne Doody , Chair (Andrew W. Mellon Professor of Humanities and Professor of English), Barbara C. Bowen, (Professor of French and Professor of Comparative Literature), Earl Fitz, (Professor of Spanish and Portuguese and Professor of Comparative Literature), William Franke, (Associate Professor of Comparative Literature and Italian and Associate Professor of Religious Studies), Cathy L. Jrade , (Professor of Spanish and

Portuguese, Chair of the Department of Spanish and Portuguese), John A. McCarthy, (Professor of German and Professor of Comparative Literature), Luigi Monga, (Professor of French and Italian), Simona Sawhney, (Mellon Assistant Professor of Comparative Literature), Patricia A. Ward, (Professor of French and Professor of Comparative Literature), David C. Wood, (Professor of Philosophy); and Dean of the College, ex officio.

Barbara C. Bowen, Professor of French and Italian and Professor of Comparative Literature, also serves as adviser to the program.

The comparative literature program emphasizes training in various methods of literary criticism and in literary history along with the study of national literatures. There is a particular emphasis on the relationship of various forms of literary theory to philosophy. Programs of study are tailored to the needs of the individual.

The master's program includes at least 30 hours of formal course work, with 9 hours in comparative literature and 21 hours in literature courses in two foreign languages or in one foreign language and English. Requirements also include a reading knowledge of two foreign languages and the presentation of a thesis. A non-thesis option is open to students who have passed the qualifying examination for the Ph.D.

The doctoral program includes at least 54 hours of formal course work, with 18 hours in comparative literature and 36 hours of literature courses from the departments of Classical Studies, English, French and Italian, Germanic and Slavic, and Spanish and Portuguese. Candidates must demonstrate proficiency in two foreign languages, through course work or by examination. Individual programs of concentration may require reading knowledge of a third foreign language.

The Committee on Humanities and Comparative Literature approves the student's program and supervises examinations.

202. Themes in World Literature. Analysis and discussion of major themes in a selected number of the great works of literature, philosophy, and the arts which have been important to civilizations both Western and Eastern from antiquity to 1600. [3] Staff. (Not currently offered)

203. Themes in World Literature. Analysis and discussion of major themes in a selected number of the great works of literature, philosophy and the arts which have been important to civilizations both Western and Eastern from 1600 to the present. SPRING. [3] Sawhney (Comparative Literature).

240. Literatures of Africa. Literatures of Africa, including works originally composed in Arabic and in French, English, or other European languages as well as in various African languages. Cultural variations are emphasized, including differences in linguistic backgrounds and religious beliefs (Islamic, Christian, and indigenous). Texts taught in translation. Authors typically included: Mafouz, Achebe, Ngugi, Soyinka, Djebar, Sembene. [3] Nzabatsinda (French). (Not currently offered)(

255. Philosophy and Literary Theory. (Also listed as Philosophy 255) A study of the relation between recent continental philosophy and theories of literature and of literary criticism. Selected works will be included. [3] (Not currently offered)

260. Twentieth-Century Continental Philosophy. (Also listed as Philosophy 260) A study of selected twentieth-century philosophers such as Derrida, Foucault, and Lacan. SPRING. [3] Wood (Philosophy).

271. Women's Writing in the Renaissance. Writing by women in England, Europe, and the Americas from 1500 to 1680. The emergence of women's literature in the age of courtly centralization and foundation of colonies. Women's entry into the public domain is seen in diverse areas of the world affected by conflict between old and new customs and beliefs, and by vision of new geographies outlining unusual spaces. Authors typically included: Maria de Zayas, Ann Bradstreet, Lady Mary Wroth, Sor Juana de la Cruz. [3] Staff. (Not currently offered)

272. Women's Writing in the Age of Enlightenment. Writing by women in England, Europe, and the Americas from 1650 to 1800. Study of relations of women's works to Enlightenment concepts includes focus on literary forms as well as their treatment of topics such as courtship, war, family, religion. Authors typically included: Margaret Cavendish, Mme de Lafayette, Mme de Graffigny, Sophie von La Roche, Anne Finch, Frances Burney, Jane Austen. [3] (Not currently offered)

278. Colonial and Post-Colonial Literature. (Also listed as English 278) Literature from countries colonized by Europe from eighteenth to twentieth century. Examines implications of colonial encounter, and formation of idea "post-colonial" culture. Subjects include language, freedom and agency, gender roles, representation of space, relation between power and narrative. Such authors as: Foster, Coetzee, Okri, Tagore, Chatterjee, Kincaid, Rushdie, Soyinka. FALL. [3] Sawhney (Comparative Literature).

290. Seminar in Methods in Comparative Literature and Theories of Reading and Interpretation. Reading methods, critical approaches including reception, aesthetic, formalism(s), and symbolic, psychological, and structure approaches. Interdisciplinary study and the methodologies of the disciplines; problems of setting side by side works of different cultures; uses and abuses of translation. Limited to seniors and graduate students. Prerequisites: 140–141 and one upper-division course, which may be taken concurrently. [3] (Not currently offered)

294a–294b. Special Topics in Comparative Literature. Topics of special interest, as announced in the *Schedule of Courses*. [3–3]

312. Varieties of Twentieth Century Poetics. Text-based, rather than contextual, approaches to literary works: New Criticism, Chicago neo-Aristotelianism, symbolic criticism of Northrop Frye, Russian formalism, Prague structuralism, Soviet semiotics, romance philology, French structuralism and poststructuralism. [3] (Not currently offered)

313. Literary Analysis and Theory. (Also listed as Spanish and Portuguese 301) Methods of literary analysis for the teaching of literature. The systematic application of contemporary theories—structuralist and post-structuralist—in the analysis of poetry and narrative. FALL. [3] Zamora (Spanish and Portuguese). (Not currently offered)

314. Anatomy of Criticism. Close analysis of the seminal theoretical texts of Northrop Frye, principally *The Great Code: The Bible and Literature, Words of Power: Being a Seco Study of The Bible and Literature* and the *Anatomy of Criticism* itself. [3] (Not currently offered)

315. Science and Literature: Creativity and Metaphor. Creative mirrorings of innovative reconfigurations in science and literature. Authors include Goethe, Dostoyevsky, Borges, Kafka, Wiesel, Koyre, Prigogine. [3] McCarthy. (Not currently offered)

318. The Boundaries of Genre. Essay, aphorism, letter, maxim, preface, review. The ethics of reading and writing with examples from philosophy, history, and cultural criticism. Montaigne, Bacon, Lessing, Goethe, Diderot, Sainte-Beuve, Lamb, Emerson, Freud, Salvador de Madariaga. [3] McCarthy (Germanic and Slavic Languages). (Not currently offered)

320. Beyond Good and Evil. A study of Nietzsche's *Beyond Good and Evil* and its significance for such works as Goethe's *Faust*, Dostoyevsky's *Notes from Underground*, Twain's *Mysterious Stranger*, and Grass's *The Tin Drum*. While texts will be provided in English translation, students are urged to read the works in the original where possible. A reading knowledge of German and/or French is valuable. SPRING. [3] McCarthy (Germanic and Slavic Languages).

325. Renaissance Wit and Humor. Theory and practice of laughter in Renaissance Italy, France, England, and Germany. [3] Bowen (French and Italian). (Not currently offered)

326. Introduction to Literary Modernism. (Also listed as English 326) Some acquaintance with French is virtually prerequisite for the course. [3] (Not currently offered)

327. Theories of Poetic Language. Literary theories in relation to poetry. Theorists such as Rousseau, Schlegel, Heidegger, Derrida, and Kristeva will be studied in relation to poets such as Wordsworth, Poe, Baudelaire, Mallarmé, and Eliot. [3] Franke (French and Italian). (Not currently offered)

330. Seminar in the Enlightenment and Its Literary Connections. (Also listed as English 330) SPRING. [3] Doody (English and Comparative Literature).

331. Nouvelle, Novella, Short Story: From Kleist to Maupassant. Focus on the nineteenth century, and in particular on the works of Kleist, Hoffmann, Poe, Mérimée, and Maupassant, with a view to identifying structures common to their narratives. [3] (Not currently offered)

332. Studies in Twentieth-Century Drama. The representation of power and history in drama. Functions of theater in relation to censorship and dogmatism. [3] (Not currently offered)

333. Don Juan: Myth and Ideology. Dramatic structures of the two foundational texts of the Don Juan myth: Tirso's *El Burlador de Sevilla* and Molière's *Don Juan*. [3] (Not currently offered)

334. The Bourgeois Novel. The role of the bourgeoisie and its social and aesthetic reflection in the dominant literary form of the late nineteenth and early twentieth centuries in England, Europe, and the Americas. Authors typically included: Gustave Flaubert, George Eliot, Henry James, Machado de Assis. [3] Fitz (Spanish and Portuguese). (Not currently offered)

336. Concepts of Realism: The Impact of Marxist Literary Theory. Twentieth-century theories of literary realism, with special emphasis on the development of Marxist theory and practice and its critics. [3] (Not currently offered)

345. Hermeneutics. (Also listed as Philosophy 345) Study of the idea of interpretation, including the Bible in the Middle Ages and Homer in Antiquity. Modern philosophical and critical theories; Heidegger, Gadamer, Ricoeur, Fish, Dilthey. [3] Franke. (Not currently offered)

350. Emergences and Application of Literary Theories. The core course of Comparative Literature, required to be taken by all graduate students in the program. Various literary theories throughout history, in various theorists from ancient to modern, and in fictional and poetic works that create or redefine what we call theory. Course is always to be team-

taught, diversity of views being part of the experience of encountering theory. A different topic of theme presented each time. May be repeated. FALL. [3] Staff.

355. Seminar in Comparative Literature.

355-01. Seminar in Comparative Literature. Introduction to Literary and Cultural Theory and Criticism. SPRING (3) L. Johnson.

355-02. French Literary Theory. Heidegger and the French Philosophers from Sartre to Nancy. SPRING (3) M. Froment-Meurice.

355-03. On What Cannot Be Said. Theologians, Philosophers, Poets; Authors include: Plato, Plotinus, Pseduo-Dionysius, Meister Eckhart, Heidegger, Wittgenstein, Blanchot, Levinas, Derrida, and Celan. Traditional as well as new and radical currents of thinking about the limits of language. Literary and philosophical versions of and responses to classic expressions of negative theology. SPRING. (3) Franke.

369. Master's Thesis Research. [0]

380. French Literary Theory. (Also listed as French 380) Literary theory as it has been shaped by and shapes the French tradition. [3] (Not currently offered)

385a–385b. Special Problems in Comparative Literature.

390a–390b. Independent Study. [Variable credit: 1–3 each semester]

399. Ph.D. Dissertation Research.

Computer Science

INTERIM CHAIR Edward J. White
DIRECTOR OF GRADUATE STUDIES Douglas H. Fisher
PROFESSORS EMERITI Charlotte F. Fischer, Patrick C. Fischer, William H. Rowan, Jr.,
    Horace E. Williams
PROFESSOR Lawrence W. Dowdy
ASSOCIATE PROFESSORS Gautam Biswas, Douglas H. Fisher, J. Michael Fitzpatrick,
    Dario A. Guise, Vijay Raghavan, Stephen R. Schach, Jeremy P. Spinrad
ASSISTANT PROFESSOR Daniel M. Gaines

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

❧ PROGRAMS are offered in computational learning theory, computational science, database systems, graph algorithms, intelligent systems, machine learning, medical image processing, performance evaluation, and software engineering.

Doctoral candidates present a minimum of 36 hours of formal course work with distribution of courses and research to be determined for each student's program. There is no language requirement.

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 requir-

ing 30 hours of course work. Under either plan at least 12 hours must be in approved 300-level courses.

The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

231. Computer Organization. The entire hierarchical structure of computer architecture, beginning at the lowest level with a simple machine model (e.g., a simple von Neumann machine). Processors, process handling, I/O handling, and assembler concepts. Graduate credit not given for computer science majors. Prerequisite: 201. FALL, SPRING. [3] Biswas, Dowdy, Raghavan.

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

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

255. Introduction to Numerical Mathematics. (Also listed as Mathematics 226) Numerical solution of linear and non-linear equations, interpolation and polynomial approximation, numerical differentiation and integration, least-squares curve fitting and approximation theory, numerical solution of differential equations, errors and floating point arithmetic. Application of the theory to problems in science, engineering, and economics. Student use of the computer is emphasized. Prerequisite: Computer programming and linear algebra. FALL, SPRING. [3] .

257. Linear Optimization. (Also listed as Mathematics 288) An introduction to linear programming and its applications. Formulation of linear programs. The simplex method, duality, complementary slackness, dual simplex method, and sensitivity analysis. The ellipsoid method. Interior point methods. Possible additional topics include the primal-dual algorithm, cutting planes, or branch-and-bound. Applications to networks, management, engineering, and physical sciences. Prerequisite: linear algebra and computer programming. SPRING. [3]

260. Artificial Intelligence. Introduction to the principles and programming techniques of artificial intelligence. Strategies for searching; representation of knowledge; automatic deduction, learning, and adaptive systems. Survey of applications. Prerequisite: 231, Computer Organization. FALL. [3] Biswas, Fisher, Gaines.

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: 231, Computer Organization. FALL. [3]

269. Project in Artificial Intelligence. Students work in small groups on the specification, design, implementation, and testing of a sizeable AI software project. Projects (e.g., an "intelligent" game player) require that students address a variety of AI subject areas, notably heuristic search, uncertain reasoning, planning, knowledge representation, and learning. Class discussion highlights student progress, elaborates topics under investigation, and identifies other relevant topics (e.g., vision) that the project does not explore in depth. Prerequisite: 260 or consent of instructor. SPRING. [3] Fisher, Biswas, Gaines.

270. Programming Languages. General criteria for design, implementation, and evaluation of programming languages. Historical perspective. Syntactic and semantic specification, compilation and interpretation processes. Study of data types and data control, procedures and parameters, sequence control, nesting, scope and storage management, run-time representations. Non-standard languages, problem-solving assignments in a laboratory environment. Prerequisite: 231, Computer Organization. SPRING. [4] Biswas, Fitzpatrick.

274. System Simulation. Introduction to simulation and comparison with other techniques. Discrete simulation models and introduction to or review of queuing theory and stochastic processes. Comparison of discrete change simulation languages. Simulation methods including generation of random numbers and variates, design of simulation experiments, analysis of data generated by simulation experiments, and validation of simulation models and results. Selected applications of simulation. Prerequisite: courses in programming and statistics. SPRING. [3]

276. Compiler Construction. Review of programming language structures, translation, loading, execution, and storage allocation. Compilation of simple expressions and statements. Organization of a compiler including compile-time and run-time symbol tables, lexical scan, syntax scan, object code generation, error diagnostics, object code optimization techniques, and overall design. Use of a high-level language to write a complete compiler. Prerequisite: 231, Computer Organization. FALL. [3] Fisher.

277. Software Engineering. The nature of software. Ensuring that software is developed correctly, on time, and within budget. Problems of software development and maintenance. The software life cycle. CASE. Issues relating to computer ethics. Management of the software production process. Ada. Team software development project. Prerequisite: 281, Principles of Operating Systems I, and 270, Programming Languages. FALL. [3] Schach.

281. Principles of Operating Systems I. Overview of goals of operating systems. Introduction to the resource allocation and control functions of operating systems. Parallel processing and primitives for their synchronization. Use of parallel processes in designing operating system subsystems. Methods for implementation of parallel processes on conventional computers. Introduction of notions of virtual memory, paging, protection of shared and non-shared information. Structures of files of data in secondary storage. Security issues. Case Studies. Prerequisite: 231, Computer Organization. FALL, SPRING. [3] Dowdy, Raghavan.

282. Principles of Operating Systems II. Projects involving modification of a current operating system. Lectures on memory management policies, including virtual memory. Protection and sharing of information, including general models for implementation of various degrees of sharing. Resources allocation in general, including deadlock detection and prevention strategies. Introduction to operating system performance measurement, for both efficiency and logical correctness. Two hours lecture and one hour laboratory. Prerequisite: 281. SPRING. [3] Raghavan, Dowdy.

283. Computer Networks. Computer communications, network architectures, protocol hierarchies, and the open systems interconnection model. Modeling, analysis, and specification of protocols. Wide area networks and local area networks including rings, buses, and contention networks. Prerequisite: 281. SPRING. [3] Raghavan, Dowdy.

284. Computer-Systems Analysis. Techniques for computer-system performance evaluation with emphasis on applications. Topics include: hardware/software/hybrid measurement and instrumentation techniques, benchmarking, simulation techniques, elementary queuing

models, data analysis, operational analysis, performance criteria case studies. Project involving a real computer system. Prerequisite: 281. FALL. [3] Dowdy.

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

311. Graph Algorithms. Algorithms for dealing with special classes of graphs. Emphasis on subclasses of perfect graphs and graphs that can be stored in a small space. Interval, chordal, permutation, comparability, and circular-arc graphs; graph decomposition. Prerequisite: 310 or Math 273. [3] Spinrad.

312. Computational Learning Theory. An overview of computational learning theory and problems of current interest. Topics include: the PAC model of learning, exact learning with queries, Occam's razor, the Vapnik-Chervonenkis dimension, techniques for proving positive and negative results for learnability, and a study of existing learning algorithms. Prerequisite: consent of instructor. FALL. [3] Raghavan.

320. Algorithms for Parallel Computing. Design and analysis of parallel algorithms for sorting, searching, matrix processing, FFT, optimization, and other problems. Existing and proposed parallel architectures, including SIMD machines, MIMD machines, and VLSI systolic arrays. Prerequisite: 310 or consent of instructor. [3] (Not currently offered)

325. Supercomputers in Scientific Computing. Overview of supercomputer architecture; dependencies and their effects on vectorization and parallel computing; the role of shared memory and communication in multitasking. Algorithms for supercomputer architectures for selected topics from linear algebra, numerical quadrature, non-linear systems, and differential equations. Prerequisite: Math 226 or 255. FALL. [3]

330. Large-Scale-Database Management Systems. Organization of major information-processing systems. Documentation methods and design techniques. The database-system life cycle. Concurrency control. Integrity constraints. Prerequisite: 265. FALL. [3]

331. Topics in Theory of Database Systems. Prerequisite: 265. [3] (Not currently offered)

357. Image Processing. (Also listed as Electrical and Computer Engineering 357) Basic techniques of image processing. Topic include image formation, digitization, linear shift-invariant processing, feature detection, and motion. Prerequisite: 174, Introduction to C or equivalent; Math 175. FALL. [3] Fitzpatrick.

358. Computer Vision. (Also listed as Electrical and Computer Engineering 358) The fundamentals of computer vision and techniques for image understanding and high-level image processing. Includes image segmentation, geometric structures, relational structures, motion, matching, inference, and vision systems. Prerequisite: 357. SPRING. [3] Staff.

360. Advanced Artificial Intelligence. Discussion of state of the art and current research issues in heuristic search, knowledge representation, deduction, and reasoning. Related application areas include: planning systems, qualitative reasoning, cognitive models of human memory, user modeling in ICAI, reasoning with uncertainty, knowledge-based system design, and language comprehension. Prerequisite: 260 or equivalent. FALL. [3] Biswas, Fisher, Gaines.

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,

East Asian Studies

DIRECTOR Derek J. Waller
ASSOCIATE PROFESSORS James J. Lang, Derek J. Waller
ASSISTANT PROFESSORS Paula K. R. Arai, Yoshikuni Igarashi, Laura A. McDaniel

❧ A NUMBER of courses are available in East Asian languages, social sciences, and humanities, from which a field of minor concentration may be constructed, subject to approval of the student's adviser.

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

The members of the Committee on East Asian Studies are Derek J. Waller *(Political Science),* Chair; George J. Graham, Jr. (*ex officio*); Paula Kane Robinson Arai *(Religious Studies),* Yoshikuni Igarashi *(History),* Xianmin Liu (*Chinese*), Sheldon Ma (*Chinese*), Laura McDaniel (*History*), and Hideko Shimizu (*Japanese*).

CHINESE: 201–202, Intensive Modern Chinese; 214–216, Second Year Chinese; 231a–231b, Chinese Calligraphy; 241–242, Third Year Chinese; 251–252, Fourth Year Chinese.

FINE ARTS: 200, Asian Art; 252, Chinese Art; 253, Japanese Art; 254, Japanese Painting and Prints.

HISTORY: 248, China in Revolution; 249, History of Modern Japan; 250, Cultural and Social History of Japan's Recent Past.

JAPANESE: 201–202, Beginning Modern Japanese; 211–212, Intermediate Modern Japanese; 241–242, Third Year Japanese; 251–252, Fourth Year Japanese.

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

RELIGIOUS STUDIES: 231, Women in Buddhist Traditions; 244, Buddhist Traditions; 249, Zen Buddhism.

Economics

CHAIR Jeremy Atack
DIRECTOR OF GRADUATE STUDIES J. S. Butler
DIRECTOR OF THE GRADUATE PROGRAM IN ECONOMIC DEVELOPMENT
    Kathryn H. Anderson
PROFESSORS Jeremy Atack, J. S. Butler, William W. Damon, Andrew F. Daughety,
    Robert A. Driskill, T. Aldrich Finegan, James E. Foster, Cliff J. Huang, Andrea Maneschi,
    Robert A. Margo, Jennifer F. Reinganum, Clifford S. Russell, John J. Siegfried,
    Ping Wang, David E. Wildasin
ASSOCIATE PROFESSORS Kathryn H. Anderson, Mario Crucini, Malcolm Getz,
    C. Elton Hinshaw, George H. Sweeney

ASSISTANT PROFESSORS William J. Collins, David Lucking-Reiley, Anandi Mani,
   Charles H. Mullin, Siobhan Reilly, Peter L. Rousseau, Jesse Schwartz, Alison Watts,
   Diana N. Weymark

DEGREES OFFERED:
   ECONOMICS. *Master of Arts, Master of Arts in Teaching, Doctor of P
   losophy*

❧ GRADUATE study in economics at Vanderbilt prepares students for
research and teaching careers in universities and for planning and leader-
ship positions in government, international agencies, and business. The
curriculum emphasizes applications of economic theory. Participation in
research projects, in joint seminars, and in informal research workshops
assures close student-faculty interaction. Students have been attracted to
the program from all parts of the United States and from more than sixty
countries. Graduate programs are offered in economics but not in business
administration. Students interested in graduate work in business adminis-
tration should apply to the Owen Graduate School of Management.

The master's program includes 24 hours of course work and a thesis
but has no language or mathematics requirement. A master's degree
(without thesis) may be awarded after completion of 42 hours of course
work and passing the Ph.D. qualifying exam.

For the Ph.D. degree, the student normally takes at least 45 hours of for-
mal course work, including required courses in economic history or his-
tory of economic thought, statistics, and econometrics, along with
recommended courses in microeconomic theory and macroeconomic the-
ory. Economics courses in this catalog numbered below 250 and the busi-
ness administration courses listed below are available for minor credit in
other 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 qual-
ifying examination, pass written examinations in economic theory (micro and
macro) and in one major elective field chosen from the following: advanced
economic theory, development, econometrics, economic history, environmen-
tal economics, 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.

All students entering the Ph.D. program are expected to take a compe-
tence test in mathematics measuring knowledge of elementary calculus. It
is highly desirable that each entering student have completed one year of
calculus and courses in intermediate microeconomic and macroeconomic
theory, statistics, and linear algebra.

Detailed information is available on request from the department.

Graduate Program in Economic Development

Students from developing countries may be interested in the Graduate Program in Economic Development. Students take courses in economic theory and statistics and in such areas as economic development, international trade, monetary and fiscal policies, and project evaluation, and can earn a Master of Arts degree. This program is described under Special Programs.

Economics

222. Latin American Economic Development. Recent economic growth and structural change of Latin American economies. The general issues of development economics will be explored, such as the mobilization of savings and capital formation, import-substituting industrialization, inflation, agricultural reform, regional and national economic integration, population growth and migration, and balance-of-payments problems. No credit for graduate students in economics. SPRING. [3] (Not currently offered)

231. Intermediate Microeconomic Theory. Development of the techniques of analysis for problems of resource allocation. Theories of choice and production for individual economic agents in competitive and monopolistic environments. Behavior of markets. Determination of prices, wages, interest, rent, and profit. Income distribution. No credit for graduate students in economics. Prerequisite: one semester of calculus. FALL, SPRING. [3] Staff.

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. FALL, SPRING. [3] Staff.

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: 201, Statistics, and 231, or consent of instructor. SPRING. [3] Mullin.

252. Antitrust Economics. The purposes and effects of antitrust laws in the United States. Economic theory applied to the problems of preserving and enhancing competition. Evaluation of incentives created by judicial precedents in terms of efficiency and performance. Prerequisite: 231 or 233. SPRING. [3] Staff.

253. Introduction to Econometrics. Quantitative methods of economic analysis. Measurement, specification, estimation, and interpretation of economic models. Introduction to econometric computation using microcomputers. No credit for graduate students in economics. Prerequisite: statistics, 231, and 232. FALL, SPRING. [3] Mullin, Kasman.

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. FALL, SPRING. [3] Reilly, Wildasin.

259. Financial Instruments and Markets. Theoretical and empirical approaches to the analysis of monetary and other financial instruments. Portfolio analysis, interest rate risk, and financial futures and options markets. Prerequisite: 231, 232. FALL, SPRING. [3] Rousseau.

261. Investment Analysis. Investment principles and practices. Emphasis on security analysis to develop techniques and standards of investment appraisal. Principles of portfolio analysis. The forecasting problem in meeting portfolio needs of individuals and institutions. Special studies to develop capacity for investigating and reporting. Prerequisite: 150 and 240. FALL. [3]

262. History of Economic Thought. A review of the principal analytical ideas of the great economists, from the mercantilists to Alfred Marshall. Prerequisite: 231 or 233; corequisite: 232 or consent of instructor. FALL. [3] Maneschi.

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. FALL, SPRING. [3] Reilly, Driskill.

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

266. Problems in United States Economic History. Several of the controversies in historical analysis will be studied. A substantial research paper dealing with one of these controversies will be required. Prerequisite: 231. FALL. [3] Margo.

267. Economics of Poverty and Discrimination. Develops methodologies used to measure the effectiveness of governmental programs aimed at reducing poverty and discrimination, and uses these methodologies to examine the equity and efficiency of current programs. Topics include social security, food stamps, and equal employment opportunity legislation. Prerequisite: 231 or consent of instructor. FALL. [3] Margo.

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] (Not currently offered)

269a–269b. Selected Topics in Economics. Topics of special interest, as announced in the *Schedule of Courses*. [variable credit: 1–3 each semester]

271. Economic History of Europe. The stages of development of capitalism and modern industry in Europe since the decline of feudalism. The interrelation of government policy, financial institutions, scientific discovery, and the spirit of individualism. Prerequisite: 231. SPRING. [3] Margo. (Not currently offered)

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. FALL, SPRING. [3] Reinganum, Watts.

275. Financial Management. (Formerly Business Administration 275) Analysis of cases representing capital budgeting, forecasting cash flow, risk assessment, capital structure, mergers and acquisitions. Seminar. Prerequisite: 240. SPRING. [3] Damon.

277. Economic Development and the Environment. The influence of economic development on the environment with special attention to developing countries. Measurement of economic growth. Sustainability of natural resources. Discussion of trade, pollution, forestry and ecotourism, population change, agriculture, and land tenure. SPRING. [3] Russell.

278. The Technical Basis for Environmental Policy. (Also listed as Civil Engineering 278 and Management of Technology 278). The engineering and economic foundations of environmental policy formation, mathematical computer modeling of the environment, and economic valuation of environmental quality. Treatment and site clean-up processes, fundamental equations of environmental engineering, the notion of market failure, and economics of monitoring and enforcement. SPRING. [3] Russell, Parker (Civil and Environmental Engineering) (Not currently offered)

279. Theory of Urban Structure. Location theory, interurban location and firm and household location, rent surfaces, and land use patterns. Transportation, housing, planning, zoning, and policy issues. Prerequisite: 231. FALL. [3] Getz.

283. Economics of Natural Resources and the Environment. Economic theory and analytical tools involved in environmental and resource problems: air and water quality and hazardous waste management. Prerequisite: 231. FALL. [3] Russell.

284. Economics of Regulation. The purposes and effects of government regulation. Analysis of natural monopoly, externalities, public goods, and information deficiencies. Case studies usually include electricity, natural gas, airlines, trucking, health and safety, communications, and the environment. Prerequisite: 231. FALL. [3] Westfield. (Not currently offered)

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

286. Economics of Human Resources. Human capital theory: economic effect of population trends, fertility, and migration. Additional topics chosen from education, household economics, health, nutrition, demand for children and child care, sex and race discrimination, crime, investment in research and development, the economic value of life and time. Prerequisite: 231 or 233 and 201, Statistics, or consent of instructor. SPRING. [3] (Not currently offered)

287. European Economic Integration. Policy issues concerning economic integration in Europe, including trade, migration, income distribution, environmental quality, macroeconomic policy, and monetary union. Analysis of European Community institutions. Prerequisite: 231; corequisite: 232. FALL. [3] (Not currently offered)

288. Theory and Problems of Development. Critical survey of models and strategies of development. Analysis of contemporary development problems and alternative policy approaches toward their solutions. Prerequisite: 231 or 232 or equivalent. FALL. [3] Mani.

300. Selected Topics in Mathematics for Economists. Selected mathematical topics used in the analysis of static and dynamic models. Prerequisite: one year of calculus (Math 171a–171b, Analytic Geometry and Calculus, or equivalent). FALL. [3] Foster.

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. FALL. [3] Watts.

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

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. FALL. [3] Watts.

304b. Microeconomic Theory II. Noncooperative game theory, information economics, public goods and an introduction to general equilibrium models. Topics include Nash equilibrium, sequential rationality, incomplete information; oligopoly; bargaining; adverse selection, signaling and screening; principal-agent models; externalities and public goods; introductory general equilibrium and welfare analysis. SPRING. [3] Daughety.

305a. Macroeconomic Theory I. Keynesian and neoclassical models of the economy. Introduction to dynamic models. FALL. [3] Driskill.

305b. Macroeconomic Theory II. Neoclassical and new theories of economic growth Overlapping generations models. SPRING. [3] Driskill.

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. FALL. [3] Huang.

307. Statistical Analysis. Statistical methods applicable to quantitative research in economics and business. Distribution theory, statistical inference, and selected multivariate statistical methods. Prerequisite: 201, Statistics, or equivalent. FALL. [3] Huang.

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. Spring. [3] Huang.

309. Econometrics. Analysis of specification errors in single equation estimation of economic relations and introduction to the estimation and application of simultaneous equation models. Prerequisite: 307 or consent of instructor. FALL. [3]

312a–312b. Health Economics. Conceptual and empirical analysis of demand for health, medical services, and insurance; decisions by physicians and hospitals about price, quantity, and quality of services; technological change; and structure and performance of the pharmaceutical industry. [3–3] (Not currently offered)

316. International Trade Theory. Classical, neoclassical, and contemporary theories of international trade; empirical evidence for them. Commercial policy, tariffs, the terms of trade and income distribution, international factor movements: economic unions. Trade and growth. Trade and welfare. FALL. [3] Maneschi. (Not currently offered)

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. SPRING. [3] Driskill.

320a–320b. Seminar in the Organization and Control of Industry. The structure of American industry; the origins and development of industrial concentration; the behavior and performance of oligopolistic and imperfectly competitive markets; the economics of public utilities. Public policy toward industrial structure and conduct, including antitrust policy, limitation of competition, and direct regulation. FALL, SPRING. [3–3] Daughety, Reinganum.

329a–329b. Labor Economics. Static and dynamic models of labor demand and labor supply, and models of human capital development. Applications of the theory to selected topics including: migration, fertility, health, wage determination, education, unionism and industrial relations, employment policies, implicit contracting and layoffs, and discrimination. Examination of methodological problems related to the analysis of labor markets. [3–3] Collins, Mullin. (Not currently offered)

331. Microeconomic Theory III. General equilibrium, social choice and welfare. Topics include: general equilibrium existence, stability and uniqueness results; fundamental theorems of welfare; core and equilibria; general equilibrium with time and uncertainty; social choice theory and mechanism design; axiomatic bargaining and welfare. FALL. [3] Weymark.

332. Theory of Money and Finance. 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 model, and others. Prerequisite: 259. SPRING. [3] Rousseau.

349a–349b. Reading Course. Designed to permit graduate students to do more intensive study in the area of their special interest than regular course offerings provide. Admission by consent of department chair and supervising professor. [Variable credit: 1–3 each semester]

353. Project Evaluation. Social-benefit cost analysis of investment projects: investment criteria, estimation of benefits and costs, and evaluation of shadow prices and of the social discount rate. The role of national planning. Case studies utilize the experience of developing economies. [3] Maneschi. (Not currently offered)

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] Wildasin. (Not currently offered)

354b. Public Finance Seminar. Special topics in applications of public finance theory, including some or all of the following: theories of fiscal federalism, fiscal politics, fiscal policy, externality and pollution, public pricing, social insurance, public income distribution, public debt, cost-benefit analysis, international aspects of public finance, generalized theory of public policy, and issues in tax-expenditure reform. Prerequisite: 354a or consent of instructor. [3] Wildasin. (Not currently offered)

355a–355b. Seminar in Research on Economic Development. How to select and define an economic problem, assemble relevant factual and statistical information, and analyze and interpret it. Students will write a research paper. May not be included in the 24 hours required for the M.A. degree. Completion of both semesters with an average grade of B counts in lieu of M.A. thesis. Open only to students in the Economic Development program. 355a FALL, SPRING; 355b SPRING. [3–3] Anderson, Huang.

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. SPRING. [3] Maneschi.

358a–358b. Policy Issues in Developing Economies. Economic analysis of problems in developing countries. 358a: Macroeconomic issues. Topics include monetary policy, financial repression and capital markets, fiscal policy, structural adjustment, inflation, and man-

agement of foreign debt. 358b: Microeconomic issues. Topics include public intervention in factor and commodity markets, migration, labor markets and employment, pricing and efficiency in the public sector, urban development and housing, and choices of technology. 358a, FALL; 358b, SUMMER. [3–3] Mani.

360. Agriculture and Economic Development. Food supply as a national problem; size and characteristics of population; agricultural technology; industrial-urban development and public policies as means of reducing market imperfections and raising output and incomes in rural areas. Case studies of the southern United States and selected underdeveloped countries. [3] (Not currently offered)

364. Economic Fluctuations and Stabilization Policy. The forces governing inflation, total output, and components of GNP, particularly investment decisions: macroeconomic models; short-term business forecasting; monetary, fiscal, and related stabilization policies. [3] (Not currently offered)

366. The Development of the American Economy. History of the American economy and of the contemporary economic issues. Topics include long-term trends in output and structure, the growth of industry and markets, demographic change, the economics of slavery and its aftermath, the evolution of the labor force, the rise of the modern corporation, the growth of government, business cycles, and the Great Depression. SPRING. [3] Margo. (Not currently offered)

369. Master's Thesis Research. [0–12]

370. Econometric Theory. Identification and estimation of simultaneous equation models. Small sample properties of estimators and Bayesian inference. Model building and testing of economic theory. Prerequisite: 309 or equivalent preparation. SPRING. [3] Butler.

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. SPRING. [3] Collins.

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] (Not currently offered)

376. Macroeconomic Theory III. Theories of consumption, investment, the demand and supply of money, the labor market. Monetary and fiscal policy. New Keynesian economics. The role of expectations. SPRING. [3] Wang.

379. Seminar in Urban Economics. Readings of current research in urban economics. Individual student research projects on topics in locational economics and urban public finance. Prerequisite: 279. Graduate students may audit 229, Urban Economics, simultaneously. [3] (Not currently offered)

383. Advanced Economics of Natural Resources and the Environment. Detailed analysis of the theoretical and empirical aspects of resource and environmental economics; modeling and empirical analysis of environmental externalities; theory of public investment as applied to natural environments; modeling and empirical analysis of renewable and nonrenewable natural resources. [3] Russell. (Not currently offered)

388. Economic Development: Macroeconomic Aspects. Examines recent work on patterns and sources of growth, models of development, trade strategies, models of structural inflation, and theories of distribution and growth. It will also cover selected topics such as

the role of financial markets and multinational corporations in the development process. Prerequisite: 288 or equivalent. [3] (Not currently offered)

389. Economic Development: Microeconomic Aspects. Analyzes market performance and determinants of growth in developing countries. Topics covered include rural and urban labor markets and their migration-induced linkages, population growth and human capital formation, the choice of technique and determinants of innovation in agriculture and industry, land tenure arrangements and their effect on agricultural output, and planning and simulation models as tools for forecasting and analyzing historical growth patterns. Prerequisite: 300. [3] (Not currently offered)

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. FALL, SPRING. [3–3] Driskill, Mango.

399. Ph.D. Dissertation Research.

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

Business Administration

258. Legal Aspects of Business Management. The legal framework of business partnerships and corporations; internal partnership management, partners as agents and principals, and partnership dissolution; powers of corporate shareholders; corporate torts and crimes; and powers and duties of corporate management. No credit for graduate students in economics or management. FALL. [3]

261. Investment Analysis. Investment principles and practices. Emphasis on security analysis to develop techniques and standards of investment appraisal. The forecasting problem in meeting the portfolio needs of individuals and institutions. Special studies to develop capacity for investigating and reporting. Prerequisite: Econ 201, Statistics, and BA 240, Business Finance. No credit for graduate students in economics or management. [3] (Not currently offered)

272. Business Policies and Management. Emphasizes decision-making functions of top management. Through case studies and written reports the student is given an insight into the administrative processes necessary to carry out business policies relating to sales, finance, procurement, and personnel. Prerequisite: 250, Principles of Marketing, or 240, Business Finance. No credit for graduate students in economics or management. [3] (Not currently offered)

275. Financial Management. Analysis of a variety of financial cases. Seminar. Prerequisite: 240, Business Finance. No credit for graduate students in economics or management. FALL. [3] Damon.

Education and Human Development

DIRECTOR OF GRADUATE STUDIES James H. Hogge
PROFESSORS EMERITI Jerold P. Bauch, Earline D. Kendall, Robert S. Whitman
PROFESSORS Leonard Bickman, John D. Bransford, Paul A. Cobb, David S. Cordray,
    Anne L. Corn, Robert L. Crowson, Jr., Paul R. Dokecki, Carolyn M. Evertson,
    Dale C. Farran, Chester E. Finn, Jr., Douglas Fuchs, Lynn S. Fuchs, Ellen B. Goldring,
    James W. Guthrie, Philip Hallinger, Ted S. Hasselbring, Ann P. Kaiser, Mark W. Lipsey,
    Joseph F. Murphy, Charles B. Myers, John R. Newbrough, Daniel Reschly,
    Victoria J. Risko, Clifford S. Russell, Travis I. Thompson, Steven F. Warren
RESEARCH PROFESSOR Paul J. Yoder
PROFESSOR OF THE PRACTICE Kent M. Weeks
ASSOCIATE PROFESSORS Jacob E. Adams, Jr., John M. Braxton, R. Wilburn Clouse,
    Angelo Collins, Joseph J. Cunningham, Elizabeth Spencer Goldman,
    Clifford A. Hofwolt, Kathleen V. Hoover-Dempsey, Carolyn Hughes, Craig Kennedy,
    Charles K. Kinzer, Richard L. Percy, Deborah W. Rowe, Robert D. Sherwood,
    Claire E. Smrekar
ASSOCIATE PROFESSORS OF THE PRACTICE Janet S. Eyler, Johan A. Madson,
    Ann B. Neely
RESEARCH ASSOCIATE PROFESSOR Linda Barron
ASSISTANT PROFESSORS Kassie Freeman, Eva M. Horn, Xiadong Lin, John M. Maslyn,
    Mary R. Watson
RESEARCH ASSISTANT PROFESSORS Alene H. Harris, Peggy P. Hester
SENIOR LECTURERS Dorothy A. Marcic, Margaret Smithey, Joseph H. Wehby

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

❧ THE graduate program in education and human development is designed to ensure that students have a grounding in the theoretical and substantive issues characterizing the field. Emphasis is placed on developing the capability to conduct systematic inquiry that will lead to new knowledge and its effective application to practices and policies affecting learning and the functioning of educational institutions.

Currently, three departments participate in the education and human development major. Within each department, students may choose an area of specialization. An overview and description of each department follows.

Major in Education and Human Development

Department	Area of Specialization
Leadership and Organizations	Education Policy
	General Administrative Leadership
	Higher Education Administration
	School Administration
	Human Resource Development

Special Education	Behavior Disorders
	Early Childhood Special Education
	Mental Retardation
	High Incidence Disabilities
	Visual Impairment
Teaching and Learning	Curriculum and Instructional Leadership
	Early Childhood Education
	Elementary Education
	Instructional Technology
	Language and Literacy Education
	Mathematics Education
	Science Education

I. *Leadership and Organizations* is designed to prepare professors of school administration and higher education as well as men and women who will undertake careers in research centers and laboratories. The purpose of the program is to prepare students to study and conduct research in the area of school and university administration as an academic discipline—rather than to prepare them to assume roles in managing and leading organizations.*

For the Ph.D. degree, areas of study include general administrative leadership, education policy, higher education administration, and school administration. Particular attention is devoted to the study of leadership, the sociology of organizations, the sociology of higher education, the social context of education, issues in evaluation, and the politics of education. Students are exposed to a wide array of inquiry tools, and both qualitative and quantitative research methodologies are highlighted. Interdisciplinary work is encouraged and fostered. Programs of study are highly individualized to meet the needs and academic interests of specific students.

II. *Special Education* is based in the multidisciplinary body of knowledge relevant to the understanding, education, and treatment of persons with disabilities. Graduate study in special education 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.

III. *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 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.

Post-baccalaureate professional degree programs (M.Ed., Ed.D.) are offered through Peabody College. Information regarding these programs is available in the *Peabody College Catalog.*

I. Leadership and Organizations

3150. Political and Organizational Analysis: Implementation. Introduction to theory and method in implementation analysis. SPRING. [3] Adams.

3450. Leadership Theory and Behavior. Introduction to the nature of organizational leadership. Focus on the behavior of individuals and small groups in organizations with special attention to the role of formal and informal leaders. A major goal of the course is to enable students to reflect on themselves as leaders in conjunction with findings from research, theory, and experience. Readings, presentations, simulations, and discussions will address issues of leadership and management with an emphasis on public sector organizations. FALL. [3] Clouse, Maslyn.

3451. Inquiry. An introduction to formal and informal inquiry processes for practitioners. Focus on problem identification and gathering, analysis, and interpretation of information relevant to the problem. Examines the framing of questions from multiple perspectives. Considers the illumination of practice through inquiry. SUMMER. [3] Staff.

3452. Images and Issues in Organizations. Explores both traditional and contemporary theories of organizations. Links organizational theory and behavior to leadership and requires an analysis of the major issues (i.e., change, gender, ethics, effectiveness) that modern complex organizations face. SPRING. [3] Crowson.

3453. The 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. SPRING. [3] Smrekar.

3460. Special Topics in Educational Leadership. Seminars, conferences, workshops, or field activities focused on current issues in educational leadership. May be repeated with change of topic. FALL, SPRING. [Variable credit: 1–6 each semester] Staff.

3510. Qualitative Research Methodology. Introduction to the assumptions, the procedures of data collection, and the criteria for judging the quality of qualitative research. Students will take the first steps toward preparing a qualitative research proposal. FALL. [3] Smrekar.

3530. Current Trends in Administration and Supervision. Such as community involvement, accountability, administrative role in change, alternative schools, due process and student/teacher rights, ethics, mainstreaming, negotiations, urban problems, and teacher evaluation. [3] (Not currently offered)

3540. Personnel Administration. Selection as the most important of all personnel functions. Recruitment, initial hire, assignment, transfer, promotion, and dismissal. [3] (Not currently offered)

3560. Power, Public Policy, and Political Processes in Administration and Supervision. The way in which decisions are made: authority and responsibility, power and influence, public policy, methods of determining power structure, superintendency, roles, tasks. [3] (Not currently offered)

3570. Restructuring America's Schools. Examination of educational reform in the United States from 1980 to the present. SUMMER. [3] Murphy.

3580. Legal Factors in Educational Administration and Supervision. 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] (Not currently offered)

3590. Symbolism in Organizations. The study and synthesis of current literature on organizational symbolism. Emphasis is placed on the role of ceremony, ritual, play, intuition, and myth in organizational life. [3] (Not currently offered)

3591. Power and Spirit in Organizations. This course considers patterns in leaders' cognition, focusing specifically on their understanding of symbolic and political priorities. Leadership capital in these two areas in the modern world are in short supply. The purpose of this course is to develop an integrated curriculum to help fill this gap. [3] (Not currently offered)

3650. Public School Business and Finance. Current problems, issues, and practices in financing public education; principles of efficient and effective operation of fiscal and business aspects of the local school district. [3] (Not currently offered)

3690. Master's Thesis Research.

3700. Computer-Based Educational Systems. Theory and application of computer-based technology in the educational process. The role and use of computer systems in management, research, and learning environments. [3] (Not currently offered)

3710. Information Management Systems. Theory, design, and analysis of computer systems for the management of information. Survey of information requirements, construction, and evaluation of systems, and operation of statistical packages. Prerequisite: 370 or consent of instructor. Additional charge of $15 for computer time. [3] (Not currently offered)

3730. Planning and Management Systems. The nature of and need for planning systems, group techniques for planning, and approaches to strategic planning, using models and simulation. SPRING. [3] Clouse.

3740. Comparative Higher Education. Examination and evaluation of contemporary issues in higher education from an international and comparative perspective, emphasizing how higher education theories and methods transcend national boundaries. SPRING. [3] Freeman.

3750. Social and Racial/Ethnic Diversity in Higher Education. 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. SPRING. [3] Staff.

3760. The American Academic Profession: Structure and Processes. 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. FALL. [3] Braxton

3800. The Nature and Function of American Higher Education. A historical study. The liberal arts college, the state university, the community junior college, adult education, women's studies, and minority-group education. FALL. [3] Freeman.

3810. College and University Curriculum. Recent practices and intensive attention to new and emerging curriculum models and relevant social and educational forces. SUMMER. [3] Braxton.

3820. The American College Student. Focus on characteristics of students admitted and retained, the impact of the college on the student, student values, and peer group influence. SPRING. [3] Braxton.

3830. Literature and Research in Higher Education. Literature, major research tools and methods, and significant research and development centers of higher education in the United States. FALL. [3] Brier.

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] (Not currently offered)

3850. College and University Administration: Organization and Structure. The role and responsibilities of governing boards, the president and other administrative offices; the involvement of faculty and student in college governance. SPRING. [3] Staff.

3851. Institutional Advancement Proseminar I. Focus 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. FALL. [3] M. Murphy.

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. SPRING. [3] M. Murphy.

3853. Strategic Marketing and Planning for Higher Education. Comprehensive review of marketing and planning for higher education, consumer behavior, market research, market planning, target marketing, segmentation, and strategic planning, and the relationship of marketing and planning to higher education. Course utilizes case studies. FALL. [3] Weeks.

3860. College Student Personnel Services. The history, philosophy, objectives, and organization of orientation, residential and off-campus living, health services, guidance and counseling, student activities, international student advising, religious affairs, etc. FALL. [3] Daniel, Madson.

3870. College and University Teaching. The teaching-learning process, with understanding of the teacher-student relationship, and the particular discipline involved in the instructional process. [3] (Not currently offered)

3880. Law and Higher Education. Benchmark laws and court decisions and the resulting implications for higher education. SUMMER. [3] Weeks.

3890. College and University Finance. Current issues in financing higher education, sources of revenue, methods of justifying requests for funds. Budgeting procedures, allocation systems, budget controls. Relation of planning to budgeting. Course is for the generalist faculty member or general administrator, not for fiscal specialists. [3] (Not currently offered)

3900. Problem-based Inquiry in Education. This course is intended to prepare practitioners with tools to investigate, understand, and address problems of educational practice. The course does not focus on a particular set of research techniques; rather, the course engages students in the process of identifying problems of practice and applying tools of inquiry. SPRING. [3] Hallinger.

3910. Methods of Educational Research. Critical evaluation of reports, library research skills, and development of research interests. SPRING. [3] Goldring.

3920. Planning Doctoral Research. Identification of a researchable topic and preparation of a model proposal for research in the student's major field or specialty. [3] (Not currently offered)

3930. Research in Education. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. FALL, SPRING. [Variable credit: 1–6 each semester] Staff.
3931. Research in School Administration.
3932. Research in Higher Education.

3950. Practicum in Education. Individual or group practicum of an educational nature in a school or other social institution. Consent of faculty supervisor required. May be repeated. FALL, SPRING. [Variable credit: 1–6 each semester] Staff.
3951. Practicum in School Administration.
3952. Practicum in Higher Education.

3960. Internship in Education. Supervised on-site experience in a professional role. Interns demonstrate advanced competencies while serving as teachers, counselors, research associates, administrative aides, or other members of professional teams. Consent of major professor required. FALL, SPRING. [Variable credit: 1–12 each semester] Staff.
3961. Internship in School Administration.
3962. Internship in Higher Education.

3990. Ph.D. Dissertation Research.

II. Special Education

3000. Education and Psychology of Exceptional Learners. An overview of people who are labeled "exceptional" and the implications for education related to them. The disabilities that people have and services, systems, and concepts associated with them. Legal, sociological, educational, political, general system theory perspectives and psychological perspectives. State and Federal law relating to education from infancy to adulthood will be related to intervention, ethics, and issues. Trends and issues related to the areas of exceptionality and relate these to previous trends, issues, and attitudes. FALL. [3] Staff.

3010. Proseminar I. Advanced review of research and scientific principles, methods, and the status of research and other professional developments in special education. Required for post–master's degree students in special education. FALL. [3] Kaiser.

3011. Proseminar II: Contrasting Research Methodologies in Special Education Research. An overview of the frameworks and major designs within three alternative research methodologies within Special Education: single-subject research, group design, and qualitative methods. Prerequisite: 301a. SPRING. [3] L. Fuchs.

3012. Research Design in Special Education. In-depth analysis of group research methodology within Special Education. Design features and statistical methods are reviewed; research is critiqued; and sample studies are designed. Prerequisite: 301a, 301b. FALL. [3] L. Fuchs.

3013. Introduction to Single-Subject Research Methodology. Initial course in the use of single subject research methodology within Special Education. Overview of behavioral measurement, single subject research designs, and methods of data analysis. Critical analysis of research articles. Development of a single subject research proposal is required. Prerequisite: 321. SPRING. [3] Staff.

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: 301d, 321. FALL. [3] Hughes.

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: 301a, 301b, 301c, 301d. SPRING. [1] Staff.

3030. Advanced Issues in Family Intervention. Issues and practices related to families with children who have special needs. Emphasis on taking a family systems prospective and a family centered approach to intervention. Provides strategies for effective communication for the purpose of information sharing and collaborative planning with families. Topics include definition and history of the family, family and professional relationships, professional ethics, models of working with families, service coordination, family assessment and the IFSP, promoting family participation in the IEP, and Public Laws, including I.D.E.A. FALL. [3] Horn.

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: 300 or consent of instructor. [3] (Not currently offered)

3070. Special Education Law. Survey of current law relating to special education of infants, toddlers, children, and youth and adults. Emphasis is on major federal statutes and regulations, particularly the Individuals with Disabilities Education Act and its regulations. Related laws include "Section 504," grants and contracts law, related state laws, leading cases (e.g., AIDS, extended school year, LRE, testing, private residential placement), IEPs, and Family Service Plans. Proper APA citation and writing about laws and cases. [3] (Not currently offered)

3120. Field Work in Special Education Teaching. Observation, participation, and classroom teaching for graduate and professional students majoring or minoring in any of the areas of exceptionality. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [1–6] Staff.

3130. Advanced Field Work in Special Education. Practicum for graduate and professional students majoring or minoring in any area of exceptionality, with opportunity for supervised participation in community special education programs. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [1–6] Staff.

3140. Extended Student Teaching for Graduate Students. Graduate student teaching, observation, participation, and full day classroom teaching. Designed for graduate students with no previous undergraduate student teaching experience. Prerequisite: 312 and consent of department. FALL, SPRING. [6] Staff.

3210. Management Procedures for Academic and Social Behavior. Application of behavioral principles in educational settings. Definition and measurement of behavior, reinforcement strategies, systematic program development, basic formats for classroom instruction, and techniques for monitoring student progress. Procedures for increasing academic and socially appropriate behavior through simulations and practice exercises. Review of research methodologies and the critical analysis of research literature in the area of applied behavior analysis are required. Students apply their skills in classroom settings. Corequisite: 1 hour of 312 or 313. FALL. [3] Wehby.

3250. Proseminar in Mental Retardation. (Also listed as Psychology and Human Development 325P) Variable topics. May be repeated with change in topic. FALL, SPRING. [2] Warren.

3300. Advanced Programming for Students with Severe Disabilities. Provides information on the nature and needs of individuals with severe/profound disabilities and the roles of federal, state, and local agencies in providing services to this population. Emphasis on strategies for the acquisition and generalized use of age-appropriate functional skills in natural community-based settings. Methods for developing, implementing, and evaluating individualized programming across specialized curricular areas such as communicative, cognitive, functional academic, motor, domestic living/self-help, recreation leisure, vocational and general community living skills. Current research evidence to support effective practices is stressed. FALL. [3] Hughes.

3310. Transition for Persons with Disabilities. Theory and practice of transition from school to community and employment living for young adults with disabilities. Legislative history and practical applications of skills such as job development and job placement. Prerequisite: 3300. [3] Hughes.

3320. Advanced Transition for Persons with Disabilities. Extends and deepens the course content of 3310. Greater emphasis on development of programs and interagency collaboration and development of community-based transition. Prerequisite: 3300, 3310, or consent of instructor. [3] Hughes.

3330. Advanced Procedures for Students with Multiple Disabilities. The causes, treatment, education, and management of students with multiple disabling conditions, including neurological impairments resulting in physical disabilities, sensory impairments, and the combination of these. Emphasis on environmental adaptations and direct training needed to maximize independence as determined through systematic ecological inventories. Physical and medical management. Competencies in research-based programming. SPRING. [3] Staff.

3340. Instructional Principles and Procedures for Students with Severe Disabilities. Characteristics and models of effective instruction, particularly for students with severe disabilities. Behavioral, ecological, and developmental learning theories and implications for instruction. Methods for defining current level of functioning, designing interventions, and monitoring learner progress. Review of fundamental special education procedures includ-

ing IEP development, task and concept analysis, effective teaching strategies, and functional curriculum programming. Current research evidence to support effective practices. [3] (Not currently offered)

3360. Advanced Procedures for Community and Employment Integration. Graduate-level course in advanced procedures in community and employment integration of persons with disabilities. Strategies that may be applied on four levels in order to facilitate integration: (a) individual, (b) school or workplace, (c) community, and (d) systems-wide. Students implement interventions in school, work, or community settings. SPRING. [3] Hughes.

3400. Advanced Trends and Issues in Early Childhood Special Education. Issues related to early intervention for preschool-aged children with disabilities; typical and atypical development in the preschool years; methods of designing individualized, functional instruction appropriate for a range of service delivery options; consultation models for early interventions; transitions to next environment. FALL. [3] Horn.

3410. Advanced Procedures in Early Intervention for Infants with Disabilities. Typical and atypical development in infancy; methods for designing individualized, family-centered programs for infants with disabilities; strategies for working with team members from other disciplines; use of community resources for infants and families; research methodology and program evaluation in early intervention. Prerequisite: 3400 or consent of instructor. SPRING. [3] Warren.

3420. Advanced Assessment Procedures for Young Children. In-depth review of measurement, theory, and practice in the assessment of early developmental problems. Course will address strategies for selecting appropriate and valid instruments and methods for the purpose of initial screening, evaluation to determine eligibility for services, and assessment to support program planning for infants, toddlers, and young children. Interpretation and synthesis of evaluation and assessment information for dissemination to families and other professionals is demonstrated. Students apply skills in early intervention, preschool, and/or early childhood education settings. FALL. [3] Staff.

3510. Educational Procedures for Visually Impaired Learners. Introduction to the literature, history, principles, programs, practices, and problems in the field. Administrative, curricular, and methodological adaptations for various educational programs. The education of individuals with visual impairments and other accompanying disabilities. SPRING. [3] Corn.

3540. Communication Skills for Visually Impaired Learners. Emphasis on methods of teaching communication skills and the preparation of materials for the visually impaired. Open only to teachers who have a working knowledge of braille. Consent of instructor required. SPRING. [3] Staff.

3550. Orientation and Mobility Skills for Teachers of Visually Impaired. Lectures, discussions, and simulated activities in teaching orientation, mobility concepts, and skills to visually impaired individuals. Offered by a mobility specialist. FALL. [3] Staff.

3580. Advanced Procedures for Visually Impaired Learners. Topics related to assessment, social skills development, transitions, career development, consumerism, and other unique areas of the core curriculum for visually impaired learners. FALL. [3] Staff.

3590. Advanced Orientation and Mobility Skills for Teachers of Visually Impaired: Practicum. Advanced course equips orientation and mobility specialists with methods, techniques, and approaches using the long cane and other mobility devices essential in the development of safe and efficient travel skills of persons with visual impairments. Demonstration, simulation, and practicum experiences in various settings. Prerequisite: 255 or consent of instructor. FALL. [3] Staff.

3600. Speech and Language for Exceptional Learners. An overview of normal language development, psycholinguistic theory, and research. Emphasis on specific intervention procedures useful for teachers of children and youth with severe/profound or mild/moderate disabling conditions. SPRING. [3] Kaiser.

3690. Master's Thesis Research.

3700. Applications of Technology in the Classroom. The use of computer-based instruction and management systems to facilitate classroom instruction. Review of the history of the development of computers; the use of technology with persons with disabilities; review and analysis of microcomputer and video technology hardware and software; overview of instructional and managerial computer applications. No previous computer experience required. SPRING. [3] Hasselbring.

3710. Advanced Applications of Technology in the Classroom. Models and techniques of instruction for integrating computers and technology into special education classroom curricula. The development, implementation, and advanced instructional and managerial applications of technology when used with disabled individuals. Prerequisite: 370 or equivalent. [3] (Not currently offered)

3720. Seminar: Microcomputer Technology in Special Education. An in-depth look at the use of existing microcomputer technology as it relates to research on teaching and learning in special education. Seminar participants review extant research on the use of microcomputer technology with special-needs populations and propose new applications of existing and developing technology. Each class member is required to participate in developing a section of a publishable manuscript on the topic "what we know about the effectiveness of special education technology," and will be expected to demonstrate basic competencies in the use of the microcomputer for research and professional dissemination activities. [3] (Not currently offered)

3800. Advanced Trends and Issues in Learning Disabilities. Advanced study of current trends, research, and issues in mild/moderate disabilities with specific emphasis on learning disabilities. Historical perspectives and theoretical models; empirical research related to definitions, identification procedures, conceptualizations, educational strategies, and service delivery options for individuals with learning disabilities. FALL. [3] D. Fuchs.

3810. Advanced Trends and Issues for Students with Behavior Disorders. Historical overview and analysis of theoretical issues regarding etiology and treatment of severe behavior disorders. Definitions, historical development, contributing factors, and major classifications of behavior disorders. Research methods used in treating disordered behavior. Ability to analyze, synthesize, and apply research methods related to prevention and management strategies with children and adolescents is required. FALL. [3] Staff.

3820. Advanced Issues and Procedures in the Assessment of Students with Mild/Moderate Disabilities. The diagnosis and evaluation of students with mild/moderate disabilities using a variety of developmentally appropriate curriculum based assessments, criterion-referenced, and norm-referenced tests in the academic and vocational subject areas. Emphasis on the interpretation of information from assessments into Individualized Education Program annual goals and objectives and instructional programming strategies. Specific consideration is given to reporting assessment information to parents, teachers and other support personnel to determine appropriate placement levels within the continuum of services. Practical application is required. FALL. [3] Reschly.

3830. Advanced Instructional Procedures for Students with Mild/Moderate Disabilities. This methodological course consists of two principal components. The first applies instructional design, delivery, and assessment procedures taught in 383 to mathematics content. Intensive instruction in the theory of direct, explicit mathematics instruction. The

second component reviews technological advances and validated learning, test-taking, study, and self-monitoring strategies for students with mild/moderate disabilities. SPRING. [3] Staff.

3840. Instructional Principles and Procedures for Students with Mild/Moderate Disabilities. Characteristics and models of effective instruction, particularly for students with disabilities or at risk for school failure. Behavioral, developmental, and cognitive learning theories and implications for instruction. Methods for defining current level of functioning, designing interventions, and monitoring learner progress. Reviews fundamental special education procedures including IEP development, task and concept analysis, effective teaching strategies, and direct instruction.. FALL. [3] Staff.

3850. Consultation Strategies for Teachers of Students with Mild/Moderate Disabilities. The history, theory, and research associated with models of school consultation with an emphasis on behavioral consultation. The use of behavioral consultation to help teachers better accommodate individuals with social and academic problems in their classrooms. Interdisciplinary consultation strategies involving parents, medical, vocational, career, and social work professionals. Prerequisite: 3800 or 3860. [3] (Not currently offered)

3860. Advanced Procedures in Classroom Management and Social Skills Instruction for Students with Mild/Moderate Disabilities. Current teaching practices in the field, with emphasis on examination of the research bases of effective teaching with students with behavior problems. Procedures for serving learners with behavior problems who are served by consultant, resource, and self-contained teachers. Students are expected to synthesize and analyze research on effective teaching and management practices and to apply the knowledge to classroom situations for students with behavior problems. SPRING. [3] Staff.

3870. Accommodating Diversity in the Classroom. Explores the importance and difficulty of teaching heterogeneously grouped students in mainstream classrooms and offers specific instructional strategies for doing so effectively. Focuses explicitly and exclusively on methods to help classroom teachers instruct and manage the behavior of a broad range of students—students with and without disabilities at multiple points along the achievement continuum. SPRING. [3] D. Fuchs.

3930. Seminar in Special Education. Special topic areas directly related to students' objectives. FALL, SPRING. [Variable credit: 1–4] Staff.

3931. Seminar: Behavioral Research in Education of the Visually Impaired. Analysis and synthesis of research, theory, and the literature in education and related psychological and social factors for blind and visually impaired persons. FALL, SPRING. [1–3] Corn.

3937. Seminar: Issues and Trends in Early Childhood Special Education. Topical seminar in research issues relevant to early childhood special education. SPRING. [Variable credit: 1–3] Kaiser.

3950. Internship in Special Education. Supervised on-site experience in a professional role as teacher, counselor, research associate, administrative aide, or other member of professional teams. Consent of major professor required. SPRING. [Variable credit: 1–12] Staff.

3960. Readings and Research in Special Education. Individual programs. May be repeated. Consent of instructor required. FALL, SPRING. [Variable credit: 1–3] Staff.

3990. Ph.D. Dissertation Research.

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

III. Teaching and Learning

Education

2040. Introduction to Classroom Technologies. An introduction to various technologies used in classrooms with an emphasis on microcomputer-based technologies. Meets licensure requirements for preservice teachers. Credit for M.A.T. students only. FALL, SPRING. [1] Sherwood.

2310. Teaching in Secondary School. Curriculum organization and patterns, teaching methods, and professionalism of the secondary-school teacher. A practicum in secondary schools included. Credit for students seeking teacher licensure only. FALL, SPRING. [3] Staff.

2320. Teaching for Understanding and Academic Literacy. Designed to assist secondary content teachers in developing multiple teaching strategies, including use of technology, to enhance students' learning opportunities in diverse classrooms. Includes an emphasis on all teachers as teachers of reading and writing. Pre- or corequisite: EDUC 2040. [2] Staff.

2430. Addressing Problems in Literacy Learning. An analysis of multiple factors contributing to literacy problems students experience, and philosophies and principles of instructional practice designed to individualize instruction and support literacy development. Provides teaching experience within a school setting. Prerequisite: EDUC 2115, 2215, or equivalent. SPRING. [3] Risko.

2920. Social and Philosophical Aspects of Education. Exploration of the interaction between contemporary social problems and various philosophies in relation to educational theory, policy, and practice. FALL, SPRING. [3] Staff.

3000. Internship in Teaching: Elementary. Observation, participation, and teaching in graduate intern centers and/or schools. Post-baccalaureate equivalent of student teaching. May be repeated to provide experiences at different levels. FALL, SPRING. [6] Staff.

3001. Internship in Teaching: Early Childhood Education. Observation, participation, and teaching in graduate intern centers and/or schools. Post-baccalaureate equivalent of student teaching. May be repeated to provide experiences at different levels. FALL, SPRING. [6] Staff.

3002. Internship in Teaching: Secondary. Observation, participation, and teaching in graduate intern centers and/or schools. Post-baccalaureate equivalent of student teaching. May be repeated to provide experiences at different levels. FALL, SPRING. [6] Staff.

3005. Internship Seminar: Elementary. Seminar to accompany EDUC 3000. FALL, SPRING. [1] Staff.

3006. Internship Seminar: Early Childhood Education. Seminar to accompany EDUC 3001. FALL, SPRING. [1] Staff.

3007. Internship Seminar: Secondary. Seminar to accompany EDUC 3002. FALL, SPRING. [1] Staff.

3030. Sociology of the Classroom. Sociological and social psychological aspects of classroom settings, group processes, and influences on teaching and student learning. FALL. [3] Evertson.

3050. Advanced Social and Philosophical Aspects of Education. Exploration of the interaction between contemporary social problems and various philosophies in relation to educational theory, policy, and practice. FALL, SPRING, SUMMER. [3] Smrekar.

3110. Psychological Foundations of Education. (Also listed as Psychology and Human Development 334P) Psychological theories and research as related to the design and practice of education. Specific consideration of the developmental bases of teaching, learning, and student performance (early childhood through adult); individual differences in education with particular reference to socioeconomic status, disabling conditions, learning style, and gender; evaluation of learning; classroom and organizational influences on school effectiveness; family-school relations. FALL, SPRING. [3] Staff.

3140. Seminar in Teaching and Learning. Theory and current practice in various content areas and at all levels of instruction, preschool through college. For graduate and professional students in Teaching and Learning. SUMMER. [3] Staff.

3170. Analysis of Teaching. Use of objective and unobtrusive evaluation procedures and methodologies in a variety of educational settings. Emphasis on theoretical base for qualitative and quantitative evaluation and methodologies. Experience given in collecting, processing, summarizing, and reporting data. SPRING. [3] Evertson.

3200. Foundations of Early Childhood Education. Historical, psychological, and social foundations, in a broad survey of early childhood education. Analysis of current approaches and trends from the foundations perspective. FALL. [3] Staff.

3210. Instructional Programs for Young Children. Compares models of current interest in curriculum, materials, methods, and staff roles. Observation in a variety of local early childhood education programs. SPRING. [3] Staff.

3220. Parents, the School, and the Community. Parent participation, parent education, and community involvement in school programs. Laboratory experiences in school settings examine ecological influences and environmental transactions among the home, school, and community. SPRING. [3] Staff.

3230. Administration and Supervision of Early Childhood Programs. Selection, training, and supervision of staff; working with regulatory agencies, boards, funding sources, and parents; evaluation of program components; and exploration of administrative theory and practice. [3] Staff. (Not currently offered)

3240. Seminar in Early Childhood Education. Relevant research as the basis for formulating policies and program development guidelines. Different topics emphasized each time course is offered. Prerequisite: two of the courses EDUC 308, 315, 316, or consent of instructor. May be repeated for credit with change of topic. [3] (Not currently offered)

3250. Advanced Seminar in Early Childhood Education. Emphasizes research, theory, and policy making that bear on current practice. Intended primarily for post–master's degree students. FALL. [3] Staff.

3370. Advanced Diagnostic Teaching Procedures in Language and Literacy. Study of issues on implementing diagnostic findings in reading K–12 and of alternative approaches in language and literacy instruction, emphasizing corrective instruction. Prerequisite: one course in developmental or remedial reading. [3] (Not currently offered)

3380. Seminar in Language and Literacy Education. Emphasis on current literacy research and topical issues. Designed to meet the needs of professional students with a major in language and literacy education. Prerequisite: EDUC 3390 or 3420. [1–3] (Not currently offered)

3390. Literacy Development. Survey of theories and approaches to developing reading and writing in school-based settings. In-depth discussion of research in the development of literacy, with an emphasis on the reading process. FALL. [3] Kinzer.

3420. Literacy for Diverse and Special Needs Learners. Emphasis on 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. SPRING. [3] Risko.

3440. Issues and Trends in Reading Instruction. Issues and trends in reading, including reading in a pluralistic society, early reading, adult reading, intervention strategies, and appraisal and measurement. FALL. [3] Risko.

3450. Psycholinguistic Aspects of Language and Literacy. Designed to provide a theoretical base for evaluating recent developments in the field of language and literacy from a psycholinguistic perspective. SPRING. [3] Kinzer.

3460. Teaching and Learning the Language Arts: Theory and Research. Provides in-depth study of theory and research on teaching and learning the language arts (reading, writing, speaking, and listening) and related literacies (e.g., art, drama). Special emphasis is given to writing development and the teaching of writing in the preschool and elementary years. FALL. [3] Rowe.

3470. Social Aspects of Language and Literacy. Introduces social and cultural theories of language and literacy learning and teaching, and the research questions and methods associated with them. Includes study of sociocultural, sociolinguistic, semiotic, anthropological, and critical theory approaches to the study of literacy learning and use. [3] (Not currently offered)

3500. Seminar on Teaching and Schools. Introduction to schools, classrooms, teaching, and the nature of students and learning. Intended for master's degree students who are in the early stages of preparing for licensure as early childhood, elementary, or secondary school teachers. SUMMER, FALL. [3] Harris.

3510. Advanced Teaching in Secondary Schools. Exploration of teacher decision-making regarding classroom climate, curriculum, and classroom management in secondary schools. A practicum in secondary schools is included. SPRING, SUMMER. [3] Smithey.

3611. Curriculum Foundations: Exploration of Educational Belief Systems and Learning Environments. A critical analysis. Also practices found in schools and other learning environments, and creation of a curricular frame of reference. FALL. [3] Collins.

3612. Curriculum Development: Designing and Constructing Responsive Curricula. Emphasis on understanding processes for development. Prerequisite: 3611 or equivalent. [3] (Not currently offered)

3621. Curriculum Design for Elementary School Programs. Focus on processes, concepts, and components which foster effective program development. Clinical and/or graduate research experiences. [3] (Not currently offered)

3623. Curriculum Designs for Secondary School Programs. Focus on processes, concepts, and components which foster effective program development. Clinical and/or graduate research experiences. [3] (Not currently offered)

3630. Exploration, Analysis, and Appraisal of Curriculum Theory, Research, and Experimentation. Emphasis on assumptions, implications, impact, and assessment as related to curricular change and teacher/learner practices at all educational levels. [3] Staff.

3690. Master's Thesis Research.

3800. Classroom Technologies: Theory and Applications Development. Examines some of the theoretical principles on which classroom technologies are based. The roles of these technologies in classroom settings are examined and students gain expertise in developing and implementing these technologies. Prerequisite: Basic computer literacy. FALL. [3] Sherwood.

3850. Seminar on Instructional Technology. Examines advanced uses of technology for instruction. Computer-based systems as well as video and hypermedia will be topics for discussion and project development. Previous microcomputer experience required. Prerequisite: 2050 or consent of instructor. [3] Sherwood.

3890. Individual Study in Education. Semi-independent study on selected topics in education. May be repeated. Prerequisite: consent of instructor. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in Education. Special issues or topics related to education. May be repeated. FALL. [Variable credit: 1–3] Staff.

3911. Methods of Educational Research: Quantitative. Survey of modes of conceptualization, problem identification, and research design. Development of skills, principles, and techniques of quantitative research, and the analysis, interpretation, and effective presentation of results. Lectures and group discussions and critiques in seminar format. FALL. [3] Evertson.

3912. Methods of Educational Research: Qualitative. Covers issues and strategies involved in collection and analysis of qualitative data. Focuses on the assumptions and related research techniques of qualitative research, framed by the post-positivist paradigm (i.e., naturalistic inquiry, ethnography). SPRING. [3] Rowe.

3921. Ethnographic and Qualitative Research in Education. This course provides in-depth knowledge of and skill with ethnographic and qualitative research theory and methods as applied to educational issues. This is the first of a two-course sequence. FALL. [3] Bloome.

3922. Ethnographic and Qualitative Research in Education. This course provides in-depth knowledge of and skill with ethnographic and qualitative research theory and methods as applied to educational issues. This is the second of a two-course sequence. SPRING. [3] Bloome.

3930. Research in Education. Individual programs of research in various education fields. Prerequisite: consent of faculty supervisor. May be repeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3990. Ph.D. Dissertation Research.

English Education

2350. Teaching English in Secondary Schools. Required for secondary school licensure in English. Credit for students seeking teacher licensure only. FALL. [3] Staff.

2450. Reading in Secondary Schools. Diagnostic instruments, reading skills, materials, and methods of teaching reading and study skills in content areas. SPRING. [4] Staff.

2920. Literature for Adolescents. Literary works appropriate to readers of middle-school and high-school age. Materials for readers of varying abilities. FALL. [3] Staff.

3000. Teaching Literature in the Preschool and Elementary Classrooms. Introduces students to the study of the field of children's literature and the principles of teaching literature in school settings. [3] Neely.

3020. Teaching Composition in the Secondary School and College. The objectives, organization, content, methods, and special problems of teaching composition. SUMMER. [3] Staff.

3030. Teaching Literature in the Secondary School and College. The objectives, organization, content, methods, and special problems of teaching literature. FALL. [3] Staff.

3040. Perspectives on the English Language. Introduction to English linguistics and to public and school issues related to the subject. For teachers and prospective teachers of English/language arts. SPRING. [3] Staff.

3220. Theory and Research in Composition Education. Composition theory and research as applied to education; examination of writing theory and practice at all levels. [3] (Not currently offered)

3230. Theory and Research in Literature Education. Literature theory and research as applied to education; examination of teaching and learning of literature at all levels. [3] (Not currently offered)

3400. Teaching Reading in the Content Areas. Study of approaches to improving reading instruction in middle and secondary schools. SPRING. [3] Staff.

3690. Master's Thesis Research.

3890. Individual Study in English Education. Semi-independent study of selected topics in English education. Prerequisite: consent of supervising instructor. May be repeated. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in English Education. May be repeated with change of topics. [Variable credit: 1–3] (Not currently offered)

3930. Research in English Education. Individual program of research in English education. Prerequisite: consent of supervising instructor. May be repeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3960. Internship in English Education. Supervised on-site experience in a professional role, as teachers, research associates, aides, or other members of professional teams. Prerequisite: consent of major professor. FALL, SPRING. [Variable credit: 1–12]

3990. Ph.D. Dissertation Research.

Foreign Language Education

2380. Teaching Foreign Language in Secondary Schools. Fundamentals of language learning and techniques of teaching. Required for secondary-school licensure in foreign languages. Credit for students seeking teacher licensure only. FALL. [3] Staff.

Mathematics Education

3360. Advanced Teaching of Mathematics in Secondary Schools. A study of teaching and learning mathematics in middle and secondary schools with particular emphasis on the theoretical and research bases for classroom practice. Examines pedagogies that increase student understanding with particular emphasis on such secondary school mathematics topics as: functions, the arithmetic to algebra transition, geometry, spatial thinking, problem-centered learning, proof, history of mathematics and its relationship to other fields. Intended only for master's degree students seeking initial licensure. FALL. [3] Thompson.

3690. Master's Thesis Research.

3810. Cognitive Theories of Mathematical Learning. (Also listed as Psychology and Human Development 381P) Examines the research literature on mathematical learning at the elementary and secondary levels. Considers both the epistemological assumptions and implications of information-processing theories, situated cognition theories, activity theory, and constructivism. SPRING. [3] Cobb.

3840. Social and Cultural Aspects of Mathematics Education. Examines the research literature on the social and cultural aspects of mathematics learning and teaching at the elementary and secondary level. Considers the coordination of psychological and social perspectives in mathematics education and deals with the implications for the development of instructional activities. [3] Cobb.

3890. Individual Study in Mathematics Education. Semi-independent study on selected topics in mathematics education. May be repeated. Prerequisite: consent of supervising instructor. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in Mathematics Education. Seminars, conferences, workshops, or field activities focused on current issues. May be repeated. [Variable credit: 1–3] (Not currently offered)

3910. Investigations in the Teaching of Elementary-School Mathematics. Current issues and research. Application to classroom instruction. SPRING. [3] Staff.

3920. Investigations in the Teaching of Secondary-School Mathematics. Research in literature of mathematics education at the secondary-school level. [3] (Not currently offered)

3930. Research in Mathematics Education. Individual program of research in mathematics education. Prerequisite: consent of supervising instructor. May be repeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3990. Ph.D. Dissertation Research.

Science Education

2160. Teaching Science for Young Children. Instructional approaches and materials for teaching science in preschool, kindergarten, and primary settings. Emphasis on learning and child development, curriculum approaches, nature of science, design of materials, and

instructional strategies. Corequisite: MTED 2060, SSED 2060, or one credit of EDUC 2080. [2] Staff.

3300. Investigations and Trends in Science Education. Science teaching and science curricula at the middle-school and senior high-school level. Philosophies, teaching strategies, materials, and research. FALL. [3] Hofwolt.

3370. Advanced Teaching of Science in Secondary Schools. Study of theory, research, issues, curriculum approaches, trends, and modern approaches of teaching science in secondary schools. Intended only for master's degree students seeking initial licensure. FALL. [3] Staff.

3400. Philosophy of Science and Teaching. Examines how the historical and epistemological foundations of the structure of knowledge can be applied to the design and evaluation of curriculum, instruction, and assessment models. Prerequisite: Phil 244, a course in cognitive psychology, or permission of the instructor. [3] Staff. (Not currently offered)

3690. Master's Thesis Research.

3890. Individual Study in Science Education. Semi-independent study on selected topics in science education. May be repeated. Prerequisite: consent of supervising instructor. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in Science Education. May be repeated. [Variable credit: 1–3] (Not currently offered)

3930. Research in Science Education. Individual program of research in science education. Prerequisite: consent of supervising instructor. May be repeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3990. Ph.D. Dissertation Research.

Social Studies Education

2160. Teaching Social Studies for Young Children. Curriculum and instruction in social studies for preschool, kindergarten, and primary children. Emphasis on learning and child development, curriculum approaches, nature of science, design of materials, and instructional strategies. Corequisite: MTED 2060, SCED 2060, and one credit of EDUC 2080. SPRING. [2] Palmeri.

3390. Advanced Teaching of Social Studies in Secondary Schools. A study of theory, research, and practice in secondary-level social studies. Students will examine multiple and conflicting purposes of social studies instruction and develop curricular models and pedagogical strategies for effective practice. Competencies that reflect effective social studies teaching practices will be developed. FALL. [3] Staff.

3450. Trends in Social Studies Education. Programs in schools and colleges. Attention to historical antecedents. The curriculum leadership role as related to social studies programs. [3] (Not currently offered)

3480. Investigations in Elementary School Social Studies. Seminar on current theory, curriculum, methodology and research in elementary social studies, with emphasis on application to the classroom. FALL. [3] Staff.

3490. Investigation in Secondary School Social Studies. Seminar on current theory, curriculum, methodology, and research in secondary school social studies with emphasis on application to the classroom. [3] (Not currently offered)

3690. Master's Thesis Research.

3890. Individual Study in Social Studies Education. Semi-independent study on selected topics in social studies education. May be repeated. Prerequisite: consent of supervising instructor. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in Social Studies Education. May be repeated. [Variable credit: 1–3] (Not currently offered)

3930. Research in Social Studies Education. Individual program of research in social studies education. Prerequisite: consent of supervising instructor. May be repeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3990. Ph.D. Dissertation Research.

Electrical Engineering and Computer Science

CHAIR Arthur J. Brodersen
DIRECTOR OF GRADUATE STUDIES Francis M. Wells
PROFESSORS A. B. Bonds, John R. Bourne, Arthur J. Brodersen, James A. Cadzow, George E. Cook, Jimmy L. Davidson, Daniel M. Fleetwood, Kenneth F. Galloway, L. Ensign Johnson, Kazuhiko Kawamura, David V. Kerns, Jr., Sherra E. Kerns, Donald L. Kinser, Ronald D. Schrimpf, Richard G. Shiavi, Janos Sztipanovits
RESEARCH PROFESSORS Eugene E. Pentecost, Edward J. White
ASSOCIATE PROFESSORS Bharat L. Bhuva, Benoit Dawant, Weng Poo Kang, Gábor Karsai, Lloyd W. Massengill, Richard Alan Peters II, Francis M. Wells, D. Mitchell Wilkes

DEGREES OFFERED:
ELECTRICAL ENGINEERING. *Master of Science, Doctor of Philosophy*

❧ PROGRAMS in electrical engineering are offered in the areas of automatic control systems, analog and digital circuits, computer engineering, intelligent systems, solid state devices, signal processing and analysis, robotics, microelectronics, and related areas in biomedical engineering.

The master of science degree program requires 24 hours of course work. Of these, 6 hours may be between the 250 and 300 level. At least 12 hours must be above the 300 level. The program includes a minor of at least 6 hours. A research thesis is required.

A total of 72 hours is required for the Ph.D. Of these, at least 36 hours must be in course work approved by the student's Ph.D. adviser. An additional 12 hours is required in course work, which may include independent study, as specified by the candidate's committee. 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 of 250-299 is allowed. At least 12 hours of coordinated study must be in a minor subject typically outside the Electrical Engineering

and Computer Science Program. The remainder of the 72 hours may be in dissertation research hours, in special readings, and in transfer credit if applicable.

Specific and current degree requirements (including course selection, committee selection, preliminary examination, thesis/dissertation, and dissertation defense policies) are detailed in the ECE Graduate Policy Document. A copy of this document should be obtained from the ECE program office.

The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

200. Elements of Electrical Engineering. (Also listed as Physics 210) An introduction to passive and active circuits. Direct-current and alternating-current circuits, power supplies, amplifiers, oscillators, wave-shaping and switching circuits. Emphasis on the operational characteristics of these circuits. For non–electrical engineering students. Prerequisite: Physics 117b, Math 222. SPRING. [3] D. Kerns.

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 input/output with 8-bit microcontrollers, control algorithms, and networking with microcontrollers. Three lectures and one laboratory. Prerequisite: EECE 116, CS 101. SPRING. [4]

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. No graduate credit for electrical engineers. Prerequisite: Physics 117b; Math 229. FALL. [3] Peters.

235. Electronic Circuits 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. Three lectures and one laboratory period. Prerequisite: 213, 216. FALL. [4] Kang, Massengill.

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

253. Image Processing. 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. Prerequisite: 214. [4] Dawant.

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: 253. [3] Peters.

256. DSP Hardware. Applications of Digital Signal Processing (DSP) chips to sampling, digital filtering, FFTs, etc. Three lectures and one laboratory period. Prerequisite: 214. [4] Wilkes.

257. Theory of Automatic Control I. Introduction to the theory and design of feedback control systems, steady-state and transient analysis, stability considerations. Credit given for only one of ECE 257 and ME 257. Prerequisite: 213. FALL. [3] Kawamura.

258. Theory of Automatic Control II. Fundamental concepts of system theory. Model representation. Linear vector spaces and their use in system analysis. Introduction to nonlinear systems and optimum control theory. Prerequisite: 257. SPRING. [3] Kawamura.

263. Signal Measurement and Analysis. (Also listed as Biomedical Engineering 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: 214. FALL. [3] Shiavi.

264. Electromechanical Energy Conversion I. Theory and design of inductors, transformers, linear actuators, and simple motors. Prerequisite: 213, Math 299. Corequisite: 233. FALL. [4] Wells. (Offered in even numbered years)

265. Electromechanical Energy Conversion II. Theory and design of rotating machines. Dynamics and control of rotating machines. Prerequisite: 264, 257. SPRING. [4] Wells. (Offered in odd numbered years)

266. Power Electronics. Introduction to solid-state power electronics. Rectifiers, semiconductor switches, AC voltage controllers, controlled rectifiers, choppers, and inverters are studied. Three lectures and one laboratory. Prerequisite: 213, 235; Math 229. SPRING. [4] Wells.

267. Power System Analysis I. Analysis of large transmission and distribution networks. Analysis of power lines, load flow, short circuit studies, economic operation, and stability are introduced. Prerequisite: 213. FALL. [3] Wells. (Offered in odd numbered years)

268. Power System Analysis II. Continued study of load flow, short circuit analysis, economic operation, and stability of power systems. Introduction to protection fundamentals. Prerequisite: 267. SPRING. [3] Wells. (Offered in even numbered years)

269. Electrical Energy Production. The production of electrical energy by conversion methods, little used today, which will become important as traditional sources of energy are depleted. Emphasis is on conservation, storage, efficiency, and direct energy conversion. Prerequisite: 213, Math 229. No credit for both 269 and ME 265. [3] (Not currently offered)

271. Introduction to Robotics. (Also listed as Mechanical Engineering 271) History and application of robots. Robot configurations including mobile robots. Spatial descriptions and transformations of objects in three-dimensional space. Forward and inverse manipulator kinematics. Task and trajectory planning. Simulation and off-line programming. Math 230 (or equivalent) and ME 141 (or equivalent) recommended. FALL. [3] Cook.

272. Advanced Software Architectures. Tools and techniques for designing complex software systems. Programming language idioms, design patterns, and high-level architecture of systems. Overview of reactive systems, client-serve architectures, distributed object systems, object database systems, and design methods for the above. Lectures and seminars. An intensive team-oriented project experience is included. Prerequisite: CS 201, knowledge of C++ language. SPRING. [3] Karsai, Biegl, Ledeczi.

273. Parallel Systems. Design of hardware and software components of configurable parallel systems with emphasis on real-time, embedded applications. Survey of current design trends and approaches, hardware and software tools for parallel systems, and analysis of state-of-the-art parallel processors. Hands-on project experience using configurable parallel configurations. Prerequisite: EECE 279. FALL. [3]

274. Informatics Engineering. (Also listed as Management of Technology 274) The study, invention, and implementation of structures and algorithms to improve communication, understanding, and management of information. Course topics include: learning to access computer-based information resources, and managing and building information products. An intensive team-oriented project experience is included. Prerequisite: 112, CS 201, ES 130, or consent of instructor. SPRING. [3] Bourne.

276. Microprocessors and Microcontrollers II. Advanced course on design and application of microprocessor-based systems. Bus architecture and timing, direct memory access, intelligent peripheral devices, device drivers, language linkage. A structured project is required. Intended for seniors. Three lectures and one laboratory. Prerequisite: 275. FALL. [4] Karsai.

277. FPGA Design. Design and applications of field-programmable gate arrays, CAD tools for design, placement, and routing. Practical experience is gained by implementing various designs on prototype FPGA board. A project is required. Prerequisite: EECE 116 or consent of instructor. SPRING. [3]

279. Real-Time System Design. Introduction to the design and implementation of real-time systems, including hardware architectures for real-time systems, basic concepts of real-time programming, real-time C programming, and features of real-time supervisors. A project is required. Three lectures and a laboratory. Prerequisite: 275. FALL. [4] Karsai.

280. Electronic Circuits 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: 235. SPRING. [3] Massengill.

281. Hybrid Microelectronics. The technologies for fabrication of microelectronic circuits and the interrelationships between material and electronic design are explored. The thick-film circuit is used as a case study to provide practical design experience. Suitable for seniors in electrical and materials science engineering. Two lectures and one laboratory. Prerequisite: 235 or consent of instructor. FALL. [3] Davidson.

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: 235 or consent of instructor. SPRING. [3] Kang.

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: 235 or consent of instructor. SPRING. [3] Davidson.

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: 216, 280, or consent of instructor. FALL. [3] Bhuva.

286. Advanced MOS Circuit Design. MOS circuit design for modern integrated microelectronics. Emphasis on recent advances in the area of CMOS analog circuits and combined digital-analog circuits. Advanced MOS circuit modelling and computer simulation, MOS cir-

cuits for both continuous-time and discrete-time signal processing, dynamic circuits, non-linear modulators, data conversion circuits, and analog VLSI. Background as well as state of the art material covered via a combination of textbooks and recent journal articles. Prerequisite: 235, 280, 285. SPRING. [3] Massengill.

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] Johnson.

291–292. Special Topics. [Variable credit: 1–3 each semester] (Offered on demand)

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] Schrimpf.

302. Electric and Magnetic Properties of Solids. Fundamentals of the electrical and magnetic properties of solids. Dielectric and magnetic properties are discussed. Prerequisite: 301 or equivalent. SPRING. [3] Staff.

303. Electromagnetic Theory. A review of electromagnetic theory using advanced mathematical techniques, electromagnetic wave propagation. [3] (Offered on demand)

305. Topics in Applied Magnetics. Selected topics in magnetism, magnetic properties of crystalline and noncrystalline materials; ferrite materials for electronics and microwave applications, resonance phenomena. Prerequisite: 302 or consent of instructor. [3] (Offered on demand)

306. Solid-State Effects and Devices I. The semiconductor equations are examined and utilized to explain basic principles of operation of various state-of-the-art semiconductor devices including bipolar and MOSFET devices. SPRING. [3] Schrimpf.

307. Solid State Effects and Devices II. The structure of solids, phonons, band theory, scattering phenomena, and theory of insulators. [3] (Offered on demand)

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] Peters. (Offered in even numbered years)

312. Digital Control Systems. Signal conversion and processing, z-transform technique, signal flow-graph method, state space approach, stability of digital control systems, time and frequency domain analysis, and digital control design. Prerequisite: 311. SPRING. [3] Cadzow.

313. Nonlinear Automatic Control Theory. Approximations, time variable parameter systems, phase plane and describing function techniques, direct method of Liapunov. [3] (Offered on demand)

314. Optimum Control Systems. Statistical analysis and optimization of systems, Pontryagin's maximum principle, self-optimizing systems, computer optimization. [3] (Offered on demand)

317. Active RC Networks. Modeling of active RC networks. Sensitivity analysis. Synthesis of modern filters. [3]

331. Robot Manipulators. (Also listed as Mechanical Engineering 331) Dynamics and control of robot manipulators. Includes material on Jacobian matrix relating velocities and static forces, linear and angular acceleration relationships, manipulator dynamics, manipulator mechanism design, linear and nonlinear control, and force control of manipulators. Prerequisite: 271 (or equivalent). SPRING. [3] Cook.

341. Electronic Circuits I. Analysis and design of analog electronics circuits with emphasis on integrated circuits. Topics include operational amplifiers, wideband amplifiers, multipliers, and phaselocked loops. FALL. [3] Brodersen.

342. Electronic Circuits II. 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] Brodersen.

343. Digital Systems Architecture. Architectural descriptions of various CPU designs, storage systems, IO systems, parallel and VonNeumann processors and interconnection networks will be studied. [3] (Offered on demand)

350. Neural Networks. (Also listed as Biomedical Engineering 350) Theory and application of parallel distributed processing networks. Basic neurobiology, biophysics of active membranes, neural network architectures, training algorithms, optimization, hardware applications. A network applications project is required. SPRING. [3] Bonds.

351. The Visual System. (Also listed as Cell Biology 347, Neuroscience 347, and 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, Engineering, and Cell 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] Casagrande (Cell Biology), Bonds, Powers (Psychology).

353. Real-Time Application Programming. Introduction to the design of real-time systems, including multiprocessor hardware architectures; basic concepts of real-time, concurrent programming; programming in Modula-2; design methodologies for real-time measurement and control systems; and real-time supervisors and operating systems. FALL. [3] Karsai.

354. Advanced Real Time Systems. A continuation of 353. Includes hybrid architectures for combining symbolic and nonsymbolic programming for real-time systems; parallel architectures and programming methods for symbolic programming of dataflow systems, connection machines, actor systems; literature reviews and projects. SPRING. [3] Karsai.

355. Intelligent Tutoring Systems (Also listed as Computer Science 364) Issues in the design and development of Intelligent Computer-Assisted Instruction (ICAI) or Intelligent Tutoring Systems (ITS) from the computer science, cognitive modeling, and educational research viewpoints. Components of ICAI systems. Student modeling, dialogue structures, tutoring strategies, and learning applications. Hardware/software development environments and user interfaces. Prerequisite: CS 260 or 360 or equivalent. FALL. [3] Staff.

356. Intelligent Robotics. Analysis and design of intelligent robotics using recent research reports. Emphasis on how artificial intelligence is advancing robotics. Obstacle avoidance, hierarchical control, and planning. SPRING. [3] Kawamura.

357. Advanced Image Processing. (Also listed as Computer Science 357) Basic techniques of image processing. Topics include image formation, digitization, linear shift-invariant processing, feature detection, and motion. Prerequisite: Math 222; some C programming. FALL. [3] Dawant.

358. Computer Vision. (Also listed as Computer Science 358) The fundamentals of computer vision and techniques for image understanding and high-level image processing. Includes image segmentation, geometric structures, relational structures, motion, matching, inference, and vision systems. Prerequisite: 357 or Computer Science 357. SPRING. [3] (Offered in odd numbered years)

359. Computer-Aided Design and Manufacturing. Computer-aided design (CAD) and manufacturing (CAM), computer-integrated manufacturing (CIM) and engineering (CIE) with applications to electrical engineering; simulation packages; user interfaces; design methodology. SPRING. [3] Cook.

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] Cadzow.

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] Cadzow.

363. Digital Signal Processing. Theory of digital signal processing with emphasis on the frequency domain description of digital filtering: discrete Fourier transforms, flowgraph and matrix representation of digital filters, digital filter design, and fast Fourier transform, discrete Hilbert transforms, and effects of finite register length. FALL. [3] Wilkes.

364. Statistical Signal Processing. The fundamentals of detection and estimation theory for signals are developed. Modern spectral analysis techniques and autoregressive-moving average processes are studied. Prerequisite: 263 or equivalent exposure. SPRING. [3] Wilkes.

369. Master's Thesis Research.

391–392. Seminar. [1–1]

393–394. Advanced Seminar for Ph.D. Candidates. [1–1]

395–396. Special Topics. Based on research and current developments in electrical engineering of special interest to staff and students. [3–3]

397–398. Independent Study. Readings and/or projects on advanced topics in electrical engineering under the supervision of the staff. Consent of instructor required. [Variable credit: 1–3 each semester]

399. Ph.D. Dissertation Research.

English

CHAIR Jerome Christensen
DIRECTOR OF GRADUATE STUDIES Michael Kreyling
PROFESSORS EMERITI Emerson Brown, Jr., Ann Jennalie Cook, Laurence D. Lerner,
    Leonard Nathanson
PROFESSORS Vereen M. Bell, Jay Clayton, Jerome Christensen, Thadious M. Davis,
    Margaret Anne Doody, Paul Elledge, Sam B. Girgus, Roy K. Gottfried, John Halperin,
    R. Chris Hassel, Jr., Mark Jarman, Michael Kreyling, Leah S. Marcus, John F. Plummer
    III, Walter L. Sullivan, Cecelia Tichi, Nancy A. Walker, Harold Lerow Weatherby, Jr.
ASSOCIATE PROFESSORS Carolyn Dever, Teresa A. Goddu, Mark L. Schoenfield,
    Mark A. Wollaeger
ASSISTANT PROFESSORS Tina Chen, Kate Daniels, Tony Early, Sean X. Goudie,
    Dennis D. Kezar, Jr., Robert Lawrence Mack, Drayton Nabers, Kathryn Schwarz,
    Sheila Smith McKoy

DEGREES OFFERED: *Master of Arts, Master of Arts in Teaching, 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 both the General Test and the Subject Test in Literature in English of the Graduate Record Examination.

Requirements for the master's degree include 24 hours of course work; M.A.–level proficiency in a foreign language; and a scholarly article at the end of the M.A. year.

Requirements for the Ph.D. include at least 51 hours of course work; Ph.D.–level proficiency in a foreign language; comprehensive examinations; and a dissertation.

Other regulations governing graduate work are available from the director of graduate studies.

204. Intermediate Fiction Workshop. Instruction in fiction writing. Supplementary readings that illustrate traditional aspects of prose fiction. Admission by consent of instructor. May be repeated once for credit. FALL, SPRING. [3] Sullivan.

205. Advanced Fiction Workshop. Continuing instruction in fiction writing. Admission by consent of instructor. May be repeated once for credit. SPRING. [3] Earley, Sullivan.

206. Intermediate Poetry Workshop. Instruction in poetry writing. Supplementary readings illustrating traditional aspects of poetry. Admission by consent of instructor. May be repeated once for credit. FALL. [3] Jarman.

207. Advanced Poetry Workshop. Continuing instruction in poetry writing. Admission by consent of instructor. May be repeated once for credit. SPRING. [3] Daniels.

209a–209b. Shakespeare. About twenty of the major plays considered in chronological order over two terms, with emphasis on Shakespeare's development as a dramatic artist. 209a is prerequisite to 209b. [3–3] Hassel.

212. Southern Literature. (Also listed as American and Southern Studies 212) The works of southern writers from Captain Smith to the present. Topics such as the Plantation Myth, slavery and civil war, Agrarianism, and "post-southernism." Authors may include Poe, Twain, Cable, Faulkner, Welty, Percy, Wright. FALL. [3] Kreyling.

215. Travel, Adventure, and Discovery in Western Literature. The significance and uses of imaginary travel in the western literary tradition, from the *Odyssey* to the present, with emphasis on the Enlightenment. Topics include scientific discovery, colonialism, and gender. FALL. [3] Bowen.

220. Chaucer. Study of *The Canterbury Tales* and Chaucer's world. FALL. [3] Plummer.

221. Medieval Literature. The drama, lyrics, romance, allegory, and satire of the fourteenth and fifteenth centuries, studied in the context of the period's intellectual climate and social change. SPRING. [3] Staff.

224. Dante's Divine Comedy. Reading and analysis of the complete *Inferno* and a study of selected cantos from the *Purgatorio* and *Paradiso*, all in English translation. SPRING. [3] Franke.

230. The Eighteenth-Century English Novel. The English novel from its beginning through Jane Austen. Development of the novel as a literary form, and study of selected works of Defoe, Richardson, Fielding, Sterne, and other novelists of the period. FALL. [3] Doody.

231. The Nineteenth-Century English Novel. The study of selected novels of Dickens, Thackeray, Emily Brontë, George Eliot, George Meredith, Thomas Hardy, and other major novelists of the period. FALL. [3] Halperin.

232a–232b. Twentieth Century American Novel. Explorations of themes, forms, and social cultural issues shaping the works of American novelists. Authors may include Fitzgerald, Faulkner, Hemingway, Hurston, Ellison, McCarthy, Bellow, Kingston, Morrison, Pynchon. 232a: emphasizes writers before 1945; 232b emphasizes writers after 1945. FALL. [3–3] Davis.

233. The Modern British Novel. The British novel from the beginning of the twentieth century to the present. Conrad, Joyce, Lawrence, Virginia Woolf, Forster, and other novelists varying at the discretion of instructor. [3] (Not currently offered)

240. The History of the English Language. The development of English syntax. History of the English vocabulary: word formation, borrowing, and semantic change. Meter. [3] (Not currently offered)

244. Critical Theory. Major theoretical approaches that have shaped critical discourse, the practices of reading, and the relation of literature and culture. SPRING. [3] Nabers.

248. Sixteenth Century. Prose and poetry of the sixteenth century. Emphasis on Spenser and his contemporaries. SPRING. [3] Enterline.

249. Seventeenth-Century Literature. Poetry and prose from 1600 to the English Civil War such as Metaphysical and Cavalier poetry, essays, romances, and satires. Authors may include Bacon, Cavendish, Donne, Herbert, Jonson, Lanier, Marvell, and Wroth. [3] (Offered 2000/01)

251. Milton. The early English poems; *Paradise Lost, Paradise Regained,* and *Samson Agonistes,* the major prose. SPRING. [3] (Offered 2000/01)

252a–252b. Restoration and the Eighteenth Century. Explorations of the aesthetic and social world of letters from the English Civil War to the French Revolution. Drama, poetry, and prose, including Restoration plays, political poetry, satire, travel narratives, and tales. Authors may include Behn, Dryden, Congreve, Addison, Swift, Finch, Pope, Fielding, Burney, Johnson, and Inchbald. 252a: earlier writers; 252b: later writers. FALL, SPRING. [3–3] Mack.

254a–254b. The Romantic Period. Prose and poetry of the Wordsworths, the Shelleys, Byron, Keats, and others. FALL. [3–3] Elledge.

255. The Victorian Period. Works of Tennyson, Browning, Arnold, Hardy, and others. SPRING. [3] (Offered 2000/01)

256. Modern British and American Poetry: Yeats to Auden. A course in the interpretation and criticism of selected modern masters of poetry, British and American, with the emphasis on poetry as an art. Poets selected may vary at discretion of instructor. FALL. [3] Bell.

258. Contemporary British and American Poetry: Auden and After. Poetry in English from the 1930s to the present. Poets studied vary at discretion of instructor. SPRING. [3] Jarman.

260. Nineteenth-Century American Women Writers. (Also listed as American and Southern Studies 260) Themes and forms of American women's prose and poetry, with the emphasis on alternative visions of the frontier, progress, class, race, and self-definition. Authors include Child, Kirkland, Fern, Jacobs, Harper, Dickinson, and Chopin. SPRING. [3] Walker.

262. Literature and Law. Study of the relationship between the discourses of law and literature. Focus on such topics as legal narratives, metaphor in the courts, representations of justice on the social stage. FALL. [3] Staff.

263. African American Literature. (Also listed as American and Southern Studies 263 and African American Studies 263) Examination of the literature produced by African Americans. May include literary movements, vernacular traditions, social discourses, material culture, and critical theories. FALL. [3] Smith McKoy.

264. Modern Irish Literature. Major works from the Irish literary revival to the present, with special attention to the works of Yeats, Synge, Joyce, O'Casey, and Beckett. SPRING. [3] Gottfried. (Offered 2000/01)

266. Nineteenth-Century American Literature. Exploration of themes, forms, and social and cultural issues shaping the works of American writers. Authors may include Cooper, Poe, Hawthorne, Douglas, Jacobs, Stowe, Melville, Dickinson, Alcott, Whitman, and Twain. FALL, SPRING. [3] Walker, Goudie.

267. Desire in America: Literature, Cinema, and History. The influence of desire and repression in shaping American culture and character from the mid–nineteenth century to the present. [3] (Not currently offered)

268a. America on Film: Art and Ideology. (Also listed as American and Southern Studies 268a) American culture and character through film, film theory, and literature. FALL. [3] Girgus.

268b. America on Film: Performance and Culture. (Also listed as American and Southern Studies 268b) Film performance in the construction of identity and gender, social meaning and narrative, public image and influence in America. SPRING. [3] Girgus.

269. Special Topics in Film. Theory and practice of cinema as an aesthetic and cultural form. SPRING. [3] Girgus.

271. Caribbean Literature. Caribbean literature from 1902 to the present. Emphasis on writing since 1952, which marks the beginning of West Indian nationalism and the rise of the West Indian novel. [3] (Offered 2000/01)

275. Ethnic American Literature. Texts and theory relevant to understanding race, culture, and ethnicity in the formation of American culture. The literature of at least three of the following groups: African Americans, Native Americans, Asian Americans, Chicano/Latino Americans, Caribbean Americans, and European America. [3] Chen. (Offered 2000/01)

276. Anglophone African Literature. From the Sundiata Epic to the present with emphasis on the novel. Attention to issues of identity, post-coloniality, nationalism, race and ethnicity in both Sub-Saharan and Mahgrib literatures. Such authors as Achebe Ngugi, Gordimer, Awoonor, and El Saadawi. SPRING. [3] Smith McKoy.

277. Asian American Literature. (Also listed as American and Southern Studies 277) Diversity of Asian American literary production with specific attention to works after 1965. Topics such as gender and sexuality, memory and desire, and diaspora and panethnicity in the context of aesthetics and politics of Asian American experience. SPRING. [3] Chen.

278. Colonial and Post-Colonial Literature. (Also listed as Comparative Literature 278) Literature from countries colonized by Europe from eighteenth to twentieth century. Examines implications of colonial encounter and formation of "post-colonial" culture and such issues as language, agency, gender roles, and relation between power and narrative. Such authors as Forster, Coetzee, Okri, Tagore, Chatterjee, Kincaid, Rushdie, Soyinka. FALL. [3] Sawhney.

286a-286b. Twentieth-Century Drama. Topics in twentieth century drama drawn from the American, British, and/or world traditions. Formal structures of dramatic literature studied within contexts of performance, theatrical production, and specific dramatic careers. Authors may include O'Neill, Albee, Hansberry, Hellman, Stoppard, Wilson, and Churchill. 286a emphasizes American drama; 286b emphasizes British and world drama. [3–3] (Offered 2000/01)

287. Love and the Novel. Ways in which novelists examine love and desire and render perspectives on them: Austen, Brontë, Conrad, Hardy, James, Mann, Proust, Trollope, and others. [3] (Not currently offered)

296a. Anglo-Saxon Language and Literature. The study of the Old English language, selected historical and literary prose, and one or two short heroic poems. [3] (Not currently offered)

Graduate seminars in English (301 through 325, 330, 350, and 355) may be taken four times for a maximum of 12 credit hours so long as topics are not duplicated.

301. Seminar in Middle English Literature. FALL. [4] Plummer.

302. Seminar in Chaucer. FALL. [4] (Not currently offered)

306. Seminar in Sixteenth-Century Literature. [4] (Not currently offered)

310. Seminar in Shakespeare. Prerequisite: 209 or its equivalent. SPRING. [4] Hassell.

312. Seminar in Seventeenth-Century Literature. FALL. [4] Kezar.

314. Seminar, 1660–1800. [4] (Not currently offered)

316. Seminar in Romantic Prose and Poetry. SPRING. [4] Elledge.

318. Seminar in Victorian Prose and Poetry. [4] (Not currently offered)

320. Studies in American Literature. SPRING. [4] Chen.

321. Studies in Southern Literature. SPRING. [4] Kreyling.

325. Seminar in Modern British and American Literature. FALL, SPRING. [4] Bell, Gottfried, Halperin.

326. Introduction to Literary Modernism. (Also listed as Comparative Literature 326) [4] (Not currently offered)

330. Seminar in the Enlightenment and Its Literary Connections. (Also listed as Comparative Literature 330) SPRING. [4] Doody.

337A. Introduction to Literary Theory. SPRING. [4] Enterline.

350. Special Problems in English and American Literature. FALL, SPRING. [4] Staff.

355. Special Topics in English and American Literature. SPRING. [4] Christensen, Davis, Franke, Jarman.

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. FALL, SPRING. [3] Wollaeger.

372. Teaching College Composition. A two-semester program intended to prepare selected Ph.D. candidates in history and philosophy to teach writing courses at the college level. Not open to graduate students in English. Prerequisite: appointment as a fifth-year teaching assistant in the 100W program. FALL. [1] Wollaeger.

399. Ph.D. Dissertation Research.

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

Environmental Engineering

CHAIR Edward L. Thackston
DIRECTOR OF GRADUATE STUDIES Edward L. Thackston
PROFESSORS Frank L. Parker, John A. Roth, Karl B. Schnelle, Jr., Richard E. Speece,
    Edward L. Thackston
ASSOCIATE PROFESSOR Alan Ray Bowers
ADJUNCT ASSOCIATE PROFESSOR James H. Clarke
ASSISTANT PROFESSOR Eugene LeBoeuf
ADJUNCT INSTRUCTOR Charles Higgins

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

❧ THE master's degree in environmental engineering may be earned through (a) the regular program that includes a thesis or (b) a non-thesis program requiring 30 hours of class work, a written report on an individual study project and a public seminar presenting and defending the report. Under the thesis plan at least 8 hours must be in 300-level courses; the non-thesis plan must include at least 12 hours at the 300 level. There are 15 hours of required courses, and the rest are electives.

The Ph.D. degree program requires all of the courses required for the master's degree, a minor of 12 hours that must be taken in another discipline, and a dissertation. A total of 48 hours of graduate-level course work is normally required. It is recommended that minor work taken outside the department be in chemistry, chemical engineering, mathematics, economics, or physics. No foreign language is required.

The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

Civil Engineering

203. Fluid Mechanics. Physical properties of fluids, fluid statics; equations of conservation of mass, energy, and momentum; dimensional analysis and similarity; principles of real fluid flows: boundary layer effects, flow through pipes, flow in open channels, drag forces on bodies. Prerequisite: CE 180, Statics, or ME 141, Statics-Dynamics; ME 190, Dynamics; and Math 229. Graduate credit for students in geology only. FALL, SPRING, SUMMER. [3]

210. Water Supply and Wastewater Collection. Hydrologic consideration of surface and ground water sources, design of distribution systems, impoundments, and control works. Hydraulics of water supply systems and sewerage works and appurtenances. Functional design of storm and sanitary sewer systems. Graduate credit for students in geology only. Prerequisite: 203 or equivalent. SPRING. [3] Thackston.

212. Hydrology. The hydrologic cycle, study of precipitation, evapotranspiration, stream flow, flood flow, ground eater, flood routing, snowmelt, and hydrometerology. Graduate credit for students in geology only. Prerequisite: 203. FALL. [3] LeBoeuf.

250. Principles of Water Treatment and Wastewater Disposal. Water quality criteria, unit operations, and processes of water treatment. Chemical and biological characteristics of wastewater; unit operations and processes of wastewater treatment; stream pollution. Not open for credit to undergraduate engineering students or graduate students with an under-graduate degree in engineering. FALL. [3] Bowers.

258. Environmental Analysis in Transportation Systems. Assessment of environmental impacts of proposed transportation projects, including analytical modeling techniques for noise and air quality. The role of environmental analysis in the project development process, including pertinent laws and regulations, is addressed. FALL. [3] Reiter (Civil Engineering).

260. Solid Waste Management. An introduction to the problem of solid waste manage-ment; types and quantities of wastes, collection and transportation of wastes; composting, landfill, incineration; recycling of wastes and product recovery; resource management as a system. SPRING. [3] Higgins.

269. Radiological Aspects of Environmental Engineering. Characterization and detec-tion of environmental radiation; biological effects of radiation; hazards, control, and disposal of radioactive wastes; use of radioactive tracers in environmental studies. SPRING. [3] Parker.

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, equi-librium processes in the environment, including the carbonate system, metal complexation and precipitation. Prerequisite: Chem 102a and b and senior standing or consent of instruc-tor. FALL. [3] Bowers.

272. Microbiology of Water, Wastewater, and Air. Principles of biology and their applica-tion to environmental science, with emphasis on the microbiology of air, water, sewage, and industrial wastes. SPRING. [3] Bowers.

273. Environmental Engineering Laboratory. Theory and application of environmental laboratory analysis. Principles and techniques of analytical chemistry and microbiology used to determine physical, chemical, and microbiological characteristics of waters and wastewaters including titrimetry, spectrophotometry, analysis of organic mixtures, measure-ment of suspended solids, microscopic examination, heterotrophic plate counting, and enumeration of coliform bacteria. Prerequisite: CE 271; corequisite: CE 272. SPRING. [3] Morris.

275. Environmental Risk Management. Development of environmental safety programs for technological operations. Focus on defining an environmental risk management process and program implementation, performing risk assessments, determining and selecting appropriate risk reduction strategies, and influencing risk management decisions internally and externally. Extensive use of case studies drawn from the chemical and energy-produc-ing industries. SPRING. [3] Abkowitz.

276. Ground-Water 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. Prerequisite: Math 229 and CE 203. SPRING. [3] LeBoeuf.

279. Economics and Law of Air and Water Resources. Economics of air and water resource conservation and development, water rights, public policy and laws relating to air and water resources. SPRING. [3] Parker, Thackston.

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

299. Special Topics. A course based on special work in a particular area as the needs and interests of the students vary. FALL, SPRING. [3]

Environmental Engineering

300. Water Quality Management. Effects of physical, chemical, biological, and physiological pollutants in streams, reservoirs, and estuaries; fate of pollutants in the environment; water quality criteria; water quality management methodology. Biological aspects of water quality control. SPRING. [3] Speece.

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] Le Boeuf.

321. Water Treatment Theory and Practice. Drinking water standards, advanced study of the theory of operation of water treatment operations and processes, relation of theory and design practice, analysis and design of water treatment units. Prerequisite: CE 211, Water and Wastewater Treatment, or equivalent. FALL. [3] Thackston.

322. Biotransformation of Environmental Contaminants. Study of the microbial transformations that convert oxygen demanding, hazardous, and toxic materials to intermediates or completely mineralized and innocuous end products. The physical and chemical parameters that control the rates and extent of these biotransformations and the design principles that govern these biochemical engineering processes. Analysis and design of wastewater treatment systems. Prerequisite: CE 211 or equivalent. FALL. [3] Speece.

323. Industrial Waste Treatment. Studies of the waste characteristics from industrial processes and their effect on the environment. Unit operations and processes of industrial waste treatment, industrial waste discharge, and water quality criteria. Prerequisite: CE 211, Water and Wastewater Treatment, or equivalent. SPRING. [3] Speece.

324. Advanced Environmental Engineering Laboratory. Laboratory and pilot plant studies of unit operations and processes of water and waste treatment, kinetics of biological oxidation systems, hydraulics of conveyance and treatment systems, and other special topics. Prerequisite: 321 and 322. SPRING. [3] Bowers.

325a–325b–325c. Individual Study. Literature review and analysis, or laboratory investigation of special problems under faculty supervision. FALL, SPRING, SUMMER. [Variable credit: 1–4 each semester] Staff.

352. Advanced Physical/Chemical Waste Treatment. (Also listed as Chemical Engineering 352) The theory of mass transfer and chemical reactor technology in advanced wastewater treatment design; physical/chemical processes in municipal and industrial wastewater treatment; evaluation of process alternatives for cost effectiveness. Prerequisite: CE 211, Water and Wastewater Treatment, or consent of instructor. SPRING. [3] Bowers, Roth.

355. Hazardous Waste Engineering. Generation, chemistry, and toxicology of hazardous materials. Legal requirements; sampling and analyses, cleanup of spills; impact of hazardous materials on the environment. Physical/chemical treatment, including incineration, land filling, and land farming. Design of safe disposal systems. FALL. [3] Parker.

369. Master's Thesis Research. [0]

399. Ph.D. Dissertation Research.

Environmental Management

❧ STUDIES in environmental management provide the guidance and support for the interdisciplinary study of environmental business, policy, law, and technology issues. The Vanderbilt Center for Environmental Management Studies brings faculty members and students together from various disciplines for collaborative study and research on topics such as environmental risk assessment, management and communication, policy analysis, civil and criminal liability, environmentally conscious manufacturing and technology management, and global environmental issues and business development.

Participating faculty include Mark D. Abkowitz *(Civil and Environmental Engineering),* Mark A. Cohen *(Management),* Frank L. Parker *(Civil and Environmental Engineering),* and Clifford S. Russell *(Economics).*

Students interested in pursing the master's or Ph.D. degree in environmental management may develop an individualized interdisciplinary program of studies as described under Special Programs.

A partial listing of relevant courses follows. See departmental listings for courses offered 1999/2000.

BIOLOGY: 238, Ecology.

CIVIL ENGINEERING: 260, Solid Waste Management; 275, Environmental Risk Management; 279, Economics and Law of Air and Water Resources.

ECONOMICS: 283, Economics of Natural Resources and the Environment; 383, Advanced Economics of Natural Resources and the Environment.

ENVIRONMENTAL AND WATER RESOURCES ENGINEERING: 300, Water Quality Management; 355, Hazardous Waste Engineering.

LAW: Environmental Law; International Environmental Law; Public and Private Regulation of Toxic Substances; Superfund; Business and Transactional Environmental Law.

MANAGEMENT: 455, Management of Environmental Issues; 457, Environmental Issues in Operations; 551, Global Environmental Issues; 556, Project in Environmental Strategy; 567, Environmental Issues in Marketing.

MANAGEMENT OF TECHNOLOGY: 278, The Technical Basis for Environmental Policy; 321, Technical Project Management; 322, Quality Management; 386, New Ventures Based on Technology and Engineering.

Fine Arts

CHAIR Leonard Folgarait
DIRECTOR OF GRADUATE STUDIES Ljubica D. Popovich
PROFESSORS EMERITI Robert A. Baldwin, Thomas B. Brumbaugh,
    F. Hamilton Hazlehurst, Milan Mihal
PROFESSORS Leonard Folgarait, Marilyn L. Murphy
ASSOCIATE PROFESSORS Michael L. Aurbach, Donald H. Evans, Vivien Green Fryd,
    Robert L. Mode, Ljubica D. Popovich, Barbara Tsakirgis
ASSISTANT PROFESSOR Amy Helene Kirschke
MELLON ASSISTANT PROFESSOR Annabeth Headrick
SENIOR LECTURER Ellen Konowitz

DEGREE OFFERED:
ART HISTORY. *Master of Arts*

❧ 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 late medieval to baroque art and nineteenth-century art in Europe and America. A research center, the Contini-Volterra Archive, is housed in the department 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, 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 graduate program. Students must take 24 hours of course work, pass a foreign language exam, and write a thesis.

200. Asian Art. A survey of sculpture, painting, and architecture in India, China, Japan, Korea, and Southeast Asia. The arts of each country will be studied in light of the historical, religious, philosophical, and cultural background. FALL. [3]

203. Aegean Art and Archaeology of the Bronze Age. (Also listed as Classical Studies 203) The art and archaeology of the major cultures around the Aegean Sea between 3000

and 1000 B.C.: Minoan, Helladic or Mycenaean of the Greek mainland, Cycladic and those of Anatolia. No credit for students who have completed 223. FALL. [3] Tsakirgis.

204. Archaic and Classical Greek Art and Architecture, 1000 to 400 B.C. (Also listed as Classical Studies 204) 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. FALL. [3] Tsakirgis.

205. Late Classical Greek and Hellenistic Art and Architecture. (Also listed as Classical Studies 205) Sculpture, vase painting, architecture, and the minor arts from after the Parthenon to the Roman Empire. A focus on those media (wall painting and mosaic) which develop significantly in this period. No credit for students who have completed 227. SPRING. [3] Tsakirgis.

206. Roman Art and Architecture. (Also listed as Classical Studies 206) 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. SPRING. [3] Tsakirgis.

210. Early Christian and Byzantine Art. The development of architecture, sculpture, painting, and the minor arts from the fourth through the fifteenth century. FALL. [3] Popovich.

211. Medieval Art. The development of architecture, sculpture, painting, and the minor arts in Europe from the eighth through the fourteenth centuries. SPRING. [3] Popovich.

212. Northern Renaissance. Painting, sculpture, and graphic arts in the Low Countries, France, and Germany from the end of the fourteenth century through the Reformation. Historical, social, and religious factors are considered as well as style. FALL. [3] Konowitz.

215. Formation and Power of Christian Images. Iconographic analysis of the origins and evolution of single figures and compositions: their religious and political messages in painting and sculpture of the Middle Ages from circa 300 to 1300. SPRING. [3] Popovich.

217. Art and Architecture of Egypt and the Ancient Near East. (Also listed as Classics 217) A survey of the art and architecture of Egypt from the fourth millennium B.C. through the Old, Middle, and New Kingdoms, and a survey of the art and architecture of the major cultures of the ancient Near East from the fourth millennium to the late sixth century B.C., including the Sumerians, Assyrians, Hittites, and Babylonians. Emphasis on sculpture, wall painting, architecture, and the minor arts. FALL. [3] Tsakirgis.

218. Italian Renaissance Art to 1500. Early development of painting and sculpture through the fourteenth century and into the full Renaissance style of Italian art, as manifested in the works of Giotto, Masaccio, Donatello, and Botticelli. Emphasis is placed on the age of the Medici. FALL. [3] Mode.

219. Italian Renaissance Art after 1500. High Renaissance and Mannerist art in sixteenth-century Italy, considering Florentine masters such as Leonardo, Michelangelo, and Pontormo, the Roman school of Raphael, and the Venetians from Giorgione and Titian to Tintoretto. SPRING. [3] Mode.

220. Renaissance-Baroque Architecture. European architecture from the fifteenth century to the French Revolution, with emphasis on its historical and social background. The various architectural movements—Renaissance, Baroque, and Rococo—are studied in terms of important architects and buildings, especially of Italy, France, and England. [3] (Not currently offered)

221. Baroque-Rococo Art. European painting from 1550 to the French Revolution, encompassing the Mannerist, Baroque, and Rococo movements as they are manifested in the works of Caravaggio, Velasquez, Rembrandt, Watteau, Hogarth, and Tiepolo. [3] (Not currently offered)

222. British Art. The arts of England and related cultures, from Van Dyck and Hogarth to Blake and the Pre-Raphaelites. Social and political context and literary influence. SPRING. [3] Mode.

230–231. Nineteenth- and Twentieth-Century European Art. A survey of painting and the graphic arts, with some consideration given to social and historical factors. 230: from Neo-Classicism through Post-Impressionism; 231: from the early expressionist movements to midcentury. FALL–SPRING. [3–3] Fryd, Folgarait.

232. Modern Architecture. A survey of nineteenth-century styles from Federal to Victorian, and major twentieth-century architects and designers from Wright and the Bauhaus to Eames and Kahn. City planning and preservation. FALL. [3] Folgarait.

234. Twentieth-Century Mexican Literature, Film, and Art. (Also listed as Latin American Studies 234) The historical, social, and political dynamic as expressed in various art forms. The relation between social reality and aesthetic form. [3] Folgarait.

240. American Art and Architecture to the Civil War. The painting, sculpture, and architecture of the United States from the Colonial period to the Civil War with an emphasis on iconography and social history, focusing especially on race and gender. FALL. [3] Fryd.

241. Art and Architecture 1865 to 1945. The painting, sculpture, and architecture of the United States between the Civil War and the Second World War with an emphasis on iconography and social history, focusing especially on race and gender. SPRING. [3] Fryd.

242. Art since 1945. A survey of art produced in the United States and Europe since 1945 with emphasis on theory and social and intellectual factors. SPRING. [3] Fryd.

245. Art of Pre-Columbian America. (Also listed as Anthropology 245) The great artistic traditions of pre-Columbian America, including the Aztec, Maya, Inca, and native North American. Styles, symbolism, and the role of art in native politics, history, and religion. [3] (Not currently offered)

252. Chinese Art. The major and minor arts from the neolithic period to the Ch'ing Dynasty, considered in relation to their religious and cultural backgrounds. SPRING. [3]

253. Japanese Art. The sculpture, painting, architecture, ceramics, and minor arts from the protohistoric period to the present. FALL. [3]

254. Japanese Painting and Prints. A survey of Japanese painting from the protohistoric period to the present, with an emphasis on schools, styles, and development of woodblock prints, as seen in their historical, religious, and cultural context. SPRING. [3]

256. Art of the Maya. (Also listed as Anthropology 256) Architecture, painting, and sculpture from 100 B.C. to artistic traditions of contemporary Maya peoples. Ritual, religion, mythology, and politics. FALL. [3] Fischer.

257. Mesoamerican Art. (Also listed as Anthropology 257) Worldview as expressed by painting, sculpture, and architecture from 2000 B.C. through the sixteenth century. Impact of religion and politics on the cities of the Olmec, Zapotec, and Aztec as seen through their artistic traditions. SPRING. [3] Fischer.

289. Independent Research. Supervised work in extension of regular offerings in the curriculum. Registration only with agreement of instructor involved. FALL, SPRING. [Variable credit: 1–3 per semester; not to exceed a total of 6]

290. Directed Study. Supervised participation in research. [Variable credit: 1–3 per semester, not to exceed a total of 6]

294. Selected Topics. May be repeated with change of content up to a total of 9 hours. [3]

301. The Methods of Art History. Comparative analysis of art historical methods including social history, post-structuralism, feminism, gender studies, stylistic analysis, and iconography. Assessment of methods in action through critiques and exercises in independent application. FALL. [3] Folgarait, Fryd.

305. Seminar in Classical Art and Architecture. (Also listed as Classics 305) SPRING. [3] Tsakirgis.

312. Seminar: Problems in Medieval Architecture. FALL. [3] Popovich.

315. Seminar: Early Renaissance Art. [3]

319. Seminar: Problems in Baroque Art. [3] (Not currently offered)

320. Seminar in British Art and Culture. [3] Mode.

324. Seminar: Studies in Twentieth-Century Art. [3] (Not currently offered)

325. Seminar: Studies in American Art. SPRING. [3] Fryd.

355. Seminar in Mesoamerican Art. [3] Headrick.

369. Master's Thesis Research. [0–6]

French and Italian

CHAIR Virginia M. Scott
DIRECTOR OF GRADUATE STUDIES Dan M. Church
PROFESSORS EMERITI Larry S. Crist, James Patty, Claude Pichois, Raymond Poggenburg,
    Morris Wachs
PROFESSORS Barbara C. Bowen, Marc Froment-Meurice, Luigi Monga, Patricia A. Ward
ASSOCIATE PROFESSORS Dan M. Church, William Franke, Virginia M. Scott
ASSISTANT PROFESSORS Hervé François Allet, Aline Baehler, Anthère Nzabatsinda,
    Holly A. Tucker
SENIOR LECTURER Tracy Barrett

DEGREES OFFERED:

FRENCH. *Master of Arts, Master of Arts in Teaching, 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 master of arts in teaching include 36 hours of course work, of which at least 18 hours are completed in French. At least 9 hours must also be completed in educational and professional courses leading to licensure.

Requirements for the Ph.D. include at least 51 hours of course work, including 14 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 twelve hours outside the department is required for students writing dissertations in the field of second language acquisition. Students are required to take French 300 and 310 during their first year of study. During the second or third year of study, they must take one course in each of the following categories:

Language/Linguistics: French 302 (required for any student specializing in medieval or Renaissance literature), French 318 (required for any student specializing in second language acquisition), or French 320. (Note: French 302 or equivalent knowledge of Medieval French is prerequisite for graduate seminars in Medieval French literature, at least one of which is required for the Ph.D.)

Literary Theory and Criticism: French 380 or an equivalent course outside the department, by permission of the Director of Graduate Studies. All graduate students are strongly urged to take French 280, Comparative Syntax of French and English.

In addition to French and English, doctoral candidates must demonstrate a reading knowledge of a foreign language appropriate to the area of specialization. However, it is strongly recommended that students have a reading knowledge of both Latin and German. Other regulations governing graduate work are available from the Director of Graduate Studies.

The Jean and Alexander Heard Library's rich collection of French materials makes research possible in all periods of French literature. The library's special collections department also houses the W. T. Bandy Center for Baudelaire and Modern French Studies, the Pascal Pia collection (nineteenth- and twentieth-century literary criticism), and the Gilbert Sigaux collection (twentieth-century French theatre).

French

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

203. Phonetics. Methodical comparison of French and English sounds. Correct formation of French sounds; oral exercises and aural training. FALL. [3] Church.

207–208. French Civilization. Cultural achievements of France within a historical and geographic context. 207: from the origins to the revolution. 208: nineteenth and twentieth centuries, Napoleon to DeGaulle. 207: FALL; 208: SPRING. [3–3] Staff.

209. Contemporary France. The culture of France today; social, economic, and political issues; literature and the arts. Offered fall and spring at Vanderbilt-in-France. [3] Jourlait.

214. Advanced Conversational French. Emphasis on idiomatic usage and strategies for oral communication. Prerequisite: 201. FALL, SPRING. [3] Staff.

215. La Provence. Geography, history, politics, architecture, and other cultural elements of Provence. Offered regularly, each semester, in the Vanderbilt-in-France program. [3]

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. FALL.[3] Nzabatsinda

226. Advanced French Grammar. A systematic review with particular attention to morphology and syntax. Prerequisite: 201 or its equivalent. FALL. [3] Scott.

232. French Poetry from Villon to Malherbe. French poetry of the fifteenth to seventeenth century, including Villon, Marot, the Ecole lyonnaise, the Pléiade, d'Aubigné. FALL. [3] Monga.

234. Medieval French Literature. Survey of medieval chronicles, theater, and lyric and didactic poetry, with an introduction to the philology of the language. [3] (Not currently offered)

235. Farce and Comedy. Evolution of comic theater from the Middle Ages to the present, including satire, social commentary, and pure theater. The relationship of plays to the times in which they are produced. Prerequisite: 220. [3] (Not currently offered)

236. Tragedy and *drame*. Evolution of noncomic theatrical forms in France from the neoclassical tragedy, through the `drame bourgeois`,the romantic melodrama, and the `drame r aliste`, to the attempts to revive tragedy in the twentieth century. SPRING. [3] Church.

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. [3] (Not currently offered)

238. The Twentieth-Century Novel. The novel as a genre in the context of modernity and post modernity. Readings will focus on narrative techniques. [3] (Not currently offered)

239. The African Novel. The postcolonial francophone novel of Maghreb and Sub-saharan illustrating issues such as tradition and modernity, the identity of Africa, the representation of women, and the ideology of language. Recommended: 222. [3] (Not currently offered)

240. Rabelais, Montaigne, and their Times. Rabelais and Montaigne in the intellectual context of the sixteenth century: humanism, the Reformation, discovery of the New World. [3] (Not currently offered)

253. Literature of the Fantastic. The theme of the fantastic in nineteenth- and twentieth-century prose fiction. Critical analysis using psychological and psychoanalytic concepts. [3] (Not currently offered)

255. French Feminist Thought: Literary and Critical. Feminist themes in twentieth-century French literature and criticism. Authors include Beauvoir, Duras, Sarraute, Irigary, Cixous. [3] (Not currently offered)

256. Contemporary French Political Thought. Themes and concepts of major twentieth-century philosophers and philosophic movements. SPRING, Vanderbilt-in-France. [3] Ravoux.

257. The Nineteenth-Century Novel and Society. Conflicts between the individual and society in the work of major nineteenth-century writers such as Chateaubriand, Balzac, Sand, Stendhal, Flaubert, and Zola. [3] (Not currently offered)

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

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. SPRING. [3] Tucker.

262. The Avant-Garde in Modern French Theater. Reactions against traditional representational theater since the mid-nineteenth century. Attempts to revive older theatrical forms as well as to create new genres. Offered at Vanderbilt-in-France. FALL. [3] Allet.

265. From Romanticism to Symbolism. Nineteenth-century literature through its major movements; Romanticism, Realism, Naturalism, and Symbolism. [3] (Not currently offered)

267. Twentieth-Century French Literature. Critical readings of representative works organized thematically with emphasis on their contextual and intertextual relationships. FALL. [3] Froment-Meurice.

280. Comparative Syntax of French and English. Intensive work on French syntax, based on translation. Open to seniors and graduate students. Prerequisite: 226. [3] (Not currently offered)

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. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed 12 over a four-semester period]

294. Special Topics in French Literature. The subject will vary and will be announced in the *Schedule of Courses*. [3]

295. Special Topics in French Language and Civilization. The subject will vary and will be announced in the *Schedule of Courses*. SPRING. [3] Hughes.

300. Introduction to Research. Materials and methods of scholarly research, with attention to their relation to theories of literature. SPRING. [3] Staff.

302. History of the French Language: Medieval Period. Syntax, morphology, phonology, emphasis on textual explication. Prerequisite: elementary knowledge of Latin. [3] (Not currently offered)

310. Foreign Language Teaching: Theory and Practice. (Also listed as German 310, Portuguese 310, and Spanish 310) Current trends in foreign language teaching with special reference to introductory language courses. Topics include linguistic and psychological

foundations, methods, skill development, course and lesson planning, text selection, and testing. Required of all entering teaching assistants. FALL. [3] Staff.

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] (Not currently offered)

320. Linguistics and the Study of French Literature. Linguistics and related disciplines such as stylistics and pragmatics and their application to the analysis of literary texts. [3] (Not currently offered)

332. Seminar in Medieval French Literature. Prerequisite: Reading knowledge of Medieval French. [3] (Not currently offered)

338. Seminar in Sixteenth-Century French Literature. [3] (Not currently offered)

342. Seminar in Seventeenth-Century French Literature. [3] (Not currently offered)

353. Seminar in Eighteenth-Century French Literature. SPRING. [3] Ward.

362. Seminar in Nineteenth-Century French Literature. FALL. [3] Staff.

369. Master's Thesis Research. [0]

372. Seminar in Twentieth-Century French Literature. SPRING. [3] Baehler.

380. French Literary Theory. (Also listed as Comparative Literature 380) Literary theory as it has been shaped by and shapes the French tradition. SPRING. [3] Franke.

388. Seminar in Francophone Literature. Literature of the French-speaking world ("La Francophonie"). [3] (Not currently offered)

394. Special Topics in French Studies. Problems, themes, or issues in literature, language, or culture approached in ways that transcend traditional chronological distinctions. FALL. [3] Bowen.

399. Ph.D. Dissertation Research.

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

Geology

CHAIR Leonard P. Alberstadt
DIRECTOR OF GRADUATE STUDIES Calvin F. Miller
PROFESSORS EMERITI Arthur L. Reesman, Richard G. Stearns
PROFESSORS Calvin F. Miller, Molly Fritz Miller, William G. Siesser
ASSOCIATE PROFESSORS Leonard P. Alberstadt, John C. Ayers
ASSISTANT PROFESSORS Martin C. Kleinrock, Jay S. Noller, Lisa E. Wells
RESEARCH ASSISTANT PROFESSORS Julia M. G. Miller, Douglas P. Smith

DEGREE OFFERED: *Master of Science*

❦ A STUDENT earns the master's degree in geology 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, biostratigraphy, environmental geology, and paleoecology. Graduate students in geology 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 geology other than that in which the student is pursuing thesis research.

201. Global Change and Global Issues. Earth processes and global change, the impact of human activities on the rate of change, particularly of the biosphere and the earth's life support systems, the atmosphere and hydrosphere. No graduate credit in Chemistry. Prerequisite: 101 and Chemistry 101a or 102a. SPRING. [3] M. Miller, Joesten (Chemistry).

220. Life Through Time. Ecology, classification, evolutionary history of important groups of fossils, emphasizing invertebrates. Change in marine ecosystems through geologic time. Causes and effects of rapid evolution events and mass extinctions. Three hours of lecture and one laboratory period per week. Prerequisite: Geology 101 or 104 or junior standing as biology major. SPRING. [4] M. Miller.

225. Earth Materials. The study of the 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. Discussion of the physical and chemical processes that form and modify earth materials and the use of these materials in interpreting earth processes of the past and present. Field trips. Three lectures and one laboratory period per week. Prerequisite: Geology 101 or 104. FALL. [4] C. Miller.

226. Petrology. Nature, distribution, and theories of origin of igneous, metamorphic, and sedimentary rocks. Mineralogy as a function of rock-forming conditions. Laboratory emphasis on description and interpretation of rocks using hand-sample and microscope techniques. Field trips. Three lectures and one laboratory period per week. Prerequisite: 225. SPRING. [4] C. Miller.

230. Sedimentology. The origin and composition of sedimentary particles, their transportation to the site of deposition, actual deposition, and the processes involved in lithifying sediments into solid rock. Emphasis on interpretation of ancient source areas and depositional environments. Terrigenous, carbonate, and other rock types will be studied. Field trips. Three lectures and one laboratory period. Prerequisite: 226. FALL. [4] Siesser.

231. Stratigraphy. Principles of organizing strata into units based on their lithologic character, their age relationships, and their fossil content. Interpretation of vertical and horizontal stratigraphic relationships. Surface and subsurface correlation techniques, with emphasis on the use of microfossils in subsurface correlation. Radiometric and magnetic dating of stratigraphic units. Critical evaluation of the regional stratigraphy of a selected area. Field trips. Prerequisite: 220. FALL. [3] Siesser. (Offered alternate years)

240. Structural Geology and Rock Mechanics. Principles of rock deformation; mechanics, fractures, folds, foliation, primary structures. Field trips. Three lectures and one laboratory period per week. Pre- or corequisite: 226. SPRING. [4] Kleinrock.

250. Soil and Environment. Morphology, taxonomy and genesis of soils. Natural and human-induced changes to the soil environment, including climatic, biologic, cultural, and geologic factors. Solutions to environmental problems related to soil. Field trips. Prerequisite: 100, 101, or 104 and junior standing in natural science, anthropology, or engineering. SPRING. [3] Noller.

251. Soil Field and Laboratory Methods. Field description of soil profiles; soil geomorphic mapping; laboratory analysis of soils. Individual research projects are required. Field trips. Prerequisite or corequisite: 250. SPRING. [1] Noller.

255. Explorational Geophysics. Seismic, gravitational, magnetic, electrical, and other physical techniques used to explore for concealed geologic features. Some study of earthquakes in relation to discovery of deep geologic features. Prerequisite: 230 or 240, senior standing in engineering or physics, or consent of instructor. [3] (Not currently offered)

257. Hydrogeology. An introduction to hydrogeology with emphasis on distribution, movement, and chemistry of groundwater. Principles of groundwater flow, water chemistry, and geology related to exploration, evaluation, development, and protection of groundwater resources. Prerequisite: 225 and one semester each of chemistry, physics, and calculus. [3] Staff. (Not offered 1999/2000)

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 General Chemistry, or consent of instructor. FALL. [3] Staff.

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 or 104 and junior standing in natural science, anthropology, or engineering. FALL. [3] Wells.

262. Quaternary Geology. The history of global environmental change over the past two million years with emphasis on the stratigraphic tools used to reconstruct environmental history including relevant geochronologic methods. Synopsis of specific paleoenvironments and case studies of glacial, coastal, alluvial, eolian, and tectonic change. Field trips. Prerequisite: 100 or 101 and junior standing in natural science, anthropology, or engineering. SPRING. [3] Wells.

265. Computer Methods in Geology. Use of microcomputers in geologic data analysis and data management. Emphasis on geological problem-solving using statistics, BASIC programming techniques, and various types of applications software. Students will use computers to complete class assignments and a research project. Prerequisite: Mathematics 170. [3] Ayers. (Not offered 1999/2000)

279. Problems in Sedimentology and Paleobiology. Relation between past life and its environment as recorded in sedimentary rocks. Emphasis on: (1) reconstructing the deposific environment and the ancient communities recorded in Paleozoic sedimentary sequences in Tennessee, and (2) investigating recent research on the interplay between ecosystems and the physical environment during critical periods of earth history. Prerequisite: 220 and 226. FALL [3] M. Miller.

289a–289b. Directed Study. Readings with related field and/or laboratory research in pursuit of a scholarly project conceived by a faculty member and executed by the student under that faculty member's supervision. Open to senior majors and graduate students. Other students must have consent of department chair. No more than a total of 6 hours in 289 and 291 count toward the major. FALL, SPRING, SUMMER. [Variable credit: 1–2 each semester] Staff.

291a–291b. Independent Study. Readings with related field and/or laboratory research in pursuit of a scholarly project conceived by the student and executed under the supervision of a faculty member. Open to senior majors and graduate students. Other students must have consent of department chair. No more than a total of 6 hours in 289 and 291 count toward the major. FALL, SPRING, SUMMER. [Variable credit: 1–2 each semester] Staff.

308. Marine Tectonics. Structural processes in the marine environment. Nature of tectonic systems and processes, especially at midocean ridge systems; generations and evolution of oceanic lithosphere; hot spot systems; plate tectonics; plate boundary processes. Prerequisite: Permission of Instructor. FALL. [3] Alternate years. Kleinrock.

312. Carbonates. A study of the mineralogy, structure, and composition of carbonate sediments and rocks and their depositional and diagenetic histories. Consideration of stratigraphic and paleogeographic interpretations. Regional case histories. Readings and field trips. Two lectures and one laboratory per week. SPRING. [3] Alberstadt.

315. Igneous Petrochemistry and Petrogenesis. Application of phase equilibria and trace element and isotope chemistry to interpretation of the origin and history of igneous rocks and to large scale geological problems to which magma genesis is relevant. Problem solving based upon geochemical data emphasized. Prerequisite: General Chemistry, and Analytic Geometry and Calculus, and Geology 226, or Chemistry 230. FALL. [3] C. Miller.

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 Geology 260 or physical chemistry. SPRING. [3] Ayers.

325. Micropaleontology. Principles and techniques of micropaleontology. Survey of the biology, classification, ecology and stratigraphic range of about twenty different microfossil groups. Detailed examination of the foraminifers, radiolarians, and calcareous nannoplankton. Role of various microfossil groups in biostratigraphic and paleo-environmental analysis. A research project will involve at least one microfossil group. Two lectures and one laboratory per week. Prerequisite: 231 or consent of instructor. FALL. [3] Siesser. (Offered alternate years)

332. Paleoecology. Interpretations of the structure of fossil communities and the characteristics of the environment in which they lived: interactions of organisms within the community, the evolution of the community and its response to changing conditions, the species concept, and pertinent aspects of evolutionary theory. Methods of collecting, presenting, and interpreting quantified paleoecological data. Field trips. Prerequisite: 220 and 230. SPRING. [3] M. Miller.

369. Master's Thesis Research.

390. Special Topics and Advanced Techniques in Geology. [Variable credit: 2–4]

Germanic and Slavic Languages

CHAIR Alice Carmichael Harris
DIRECTOR OF GRADUATE STUDIES Dieter H. O. Sevin
PROFESSOR EMERITUS Richard N. Porter
PROFESSORS Antonina Filonov Gove, Alice Carmichael Harris, John A. McCarthy,
    Helmut F. Pfanner, Dieter H. O. Sevin
ASSOCIATE PROFESSORS Konstantin V. Kustanovich, David A. Lowe
ASSISTANT PROFESSORS Laurie Johnson, Meike G. J. Werner
SENIOR LECTURER Thomas M. Heine

DEGREES OFFERED:

GERMAN. *Master of Arts, Master of Arts in Teaching, Doctor of Philosophy*

❧ GRADUATE studies in German at Vanderbilt lead to the M.A., the M.A.T., 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: they must 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 thirty hours are to be at the 300 level in the department, and a minimum of three hours should be in a graduate seminar (i.e., numbered 386–391). Up to six 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 twenty-five to thirty page research paper 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 for six credit hours. The latter is a research paper of fifty to eighty pages in length which gives evidence of scholarly competence and independent, critical thought. The research-writing requirement for this latter option is satisfied after the formal course work has been completed.

The department expects candidates to meet all 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. For candidates without previous graduate study, the M.A. examination is administered

toward the end of the third semester at Vanderbilt. 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.

The M.A.T. option offers up to 12 semester hours in the areas of methods of teaching (courses, research projects, and teaching internships). Work in this area is in addition to the minimum degree requirements for the M.A. in German. Students opting for the full program can expect to add at least one semester's work to their course of study.

Doctor of Philosophy

Admission to the M.A. 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 Germanistik, 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 descriptive linguistics, the philosophy of language, political and social history, women's writing and the production of culture, censorship practices, or the impact of philosophy on aesthetic concepts and forms. Students completing a dissertation have the option under certain conditions of enrolling in 3995, half-time research (maximum of six years).

The director of graduate studies in German assists in devising related areas of concentration so that the student, at this stage, can be narrowing

her/his focus for a dissertation topic. Faculty members actively assist students to determine the most promising topics for innovative research by pointing out interesting knowledge gaps, theoretical issues, or interdisciplinary questions.

A reading knowledge of French is usually expected, but another language may be substituted with the approval of the examination committee if it is felt that this language is relevant to the candidate's area of concentration or dissertation research. The second language requirement must be fulfilled before the candidate may take the comprehensive examination.

The teaching program option offers up to 12 credit hours in the area of teaching methodology (courses, research projects, and teaching internships). Work in this area does not count toward minimum degree requirements; 4 hours is normally the minimum in this program. Students opting for the full program should expect to add at least one semester to their course of study.

German

213–214. Intermediate German Conversation and Composition. Graduate credit for M.A.T. candidates only. Prerequisite: 103. [3–3] Johnson, Sevin.

216. Business German. The culture of the German business community; differences which 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] Sevin.

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. FALL. [3] Pfanner.

235. German Romanticism. The contributions of Schlegel, Tieck, Novalis, Eichendorff, and others to literature and theory. Intellectual, social, and political currents. [3] Johnson.

248. The German Lyric. A formal and historical study of German lyric poetry. [3] McCarthy.

262. German Literature of the Middle Ages. A survey of the main movements and principal works with emphasis on Middle High German literature. [3]

263. The Age of Goethe. A literary-historical survey of the development of German literature during Goethe's lifetime. Reading and discussion of selected representative works. SPRING. [3] McCarthy.

264. Nineteenth-Century Drama. The German drama and dramatic theory from Romanticism up to Naturalism with emphasis on selected works by Kleist, Büchner, Grillparzer, and Hebbel. [3]

265. Twentieth-Century Drama. Modern German drama and dramatic theory from Naturalism to the present. Emphasis on Brecht and post–Brechtian drama. [3] Pfanner.

266. Nineteenth-Century Prose. A study of representative works of the main literary trends from Romanticism to Naturalism. [3]

267. The German Novel of the Twentieth Century. A study and interpretation of the main literary trends and major figures in the novel from Expressionism to the present. [3] Sevin.

268. Modern German Short Story. From 1945 until the present, including such authors as Ilse Aichinger, Heinrich Boell, Wolfgang Borchert, Ingeborg Bachmann, and Alexander Kluge. [3] Pfanner.

269. East German Literature. An introduction to the main literary trends and authors of the German Democratic Republic (1949–1989). FALL. [3] Sevin.

270. German Film. A survey of the German film with special attention to its sociocultural context and to pertinent theories of photography and of cinematic narration. No knowledge of German required. [3] Sevin.

280. *Sturm und Drang.* The contribution of the `Sturm und Drang` (1766–84) to German literature and critical theory. English and French influences will be noted. Works by Herder, Goethe, Wagner, Schiller, and others. [3] McCarthy.

289a–289b. Independent Readings. Designed for majors and qualified undergraduates. Consists of a project to be carried out under the supervision of a member of the department. All projects must be approved by the department. [Variable credit: 1–3 each semester, not to exceed a total of 6 over a four-semester period, in both courses combined]

294a–294b. Selected Topics. Topics of special interest in language, literature, and culture, e.g., The Image of America in German Literature, German Exile Literature, Germany in the Twenties, Kafka, Brecht, Scientific Readings, Literature and Art in the Middle Ages, `Faust` Austrian and Swiss Literature. Topics to be announced in the `Schedule of Courses.` SPRING. [3–3, not to exceed a total of 12] Pfanner, Hughes (Spanish).

301. Stylistics. Analysis of various styles of modern literary texts. No credit for students who have taken 290. FALL. [3] Pfanner.

310. Foreign Language Teaching: Theory and Practice. (Also listed as French 310, Portuguese 310, and Spanish 310) Current trends in foreign language teaching with special reference to introductory language courses. Topics include linguistic and psychological foundations, methods, skill development, course and lesson planning, text selection, and testing. Required of all entering teaching assistants. FALL. [3] Scott (French and Italian).

314. Bibliography and Methods. An introduction to the resources and practice of literary history and criticism. FALL. [3] McCarthy.

316. Literary Theory and Criticism. Selected problems of literary theory, history, and interpretation. SPRING. [3] Johnson.

329a. Teaching Program Option: Internship in Advanced Language and Literature Courses. Graduate interns participate in the teaching of advanced language or literature courses and receive training in the writing of syllabi, text selection, testing, the development of supplementary materials, the selection of visual aids. FALL, SPRING. [Variable credit: 1–2 each semester, not to exceed a total of 6]

330. Expressionism. The chief intellectual movement in Germany and Austria from 1910 to 1925. Topics include all genres of literature with frequent references to other disciplines including politics, the pictorial arts, and film. In German. [3] Pfanner

335. The Enlightenment and Storm and Stress. The Storm and Stress movement (Goethe, Herder, Lenz, Klinger, Bürger, Schiller) in the context of, and in contrast to, the German Enlightenment (Lessing, Kant). [3] McCarthy

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]

355. Concepts of Realism: The Impact of Marxist Literary Theory and Criticism. (Also listed as Comparative Literature 336) Twentieth-century theories of literary realism, with special emphasis on the development of Marxist theory and practice and its critics. [3]

369. Master's Thesis Research. [0]

385a–385b. Problems In Germanic Languages and Literatures. [3–3] Werner.

Graduate seminars in German explore individual authors, forms, theories, or works at an advanced level. Recent selections include Twentieth-Century Reception of Medieval Literature, Rise of the Author, Büchner, Kleist, Expressionism, Exile Literature, and Christia Wolf. Topics to be announced in the Schedule of Courses. *May be repeated for credit.*

387. Seminar: Studies in Medieval Literature. [3] (Not currently offered)

388. Seminar: Studies in Literature 1400–1680. [3] (Not currently offered)

389. Seminar: 18th-Century German Literature. [3]

390. Seminar: 19th-Century German Literature. FALL. [3] Sevin.

391. Seminar: 20th-Century German Literature. FALL, SPRING. [3] Pfanner, Sevin.

392. Seminar: Problems of Theory in German Studies. [3] (Not currently offered)

399. Ph.D. Dissertation Research.

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

Russian

Courses in Russian may be used as minor credit in graduate programs.

221–222. Survey of Russian Literature. A study of the main currents, writers, and works of Russian literature. 221: from the Kievan period to the nineteenth century; Pushkin, Lermontov, Gogol, Turgenev, and Tolstoy. 222: from the nineteenth century; Dostoevsky, Chekhov, Blok, Zamyatin, Sholokhov, Pasternak, and Solzhenitsyn. No knowledge of Russian required. Russian majors or minors will be expected to do their reading in Russian. Graduate credit for M.A. candidates only. [3–3] (Offered 2000/01)

223–224. Composition and Conversation. Development of all language skills at the intermediate-advanced level. Reading of contemporary short stories. Prerequisite: 204. [3-3] Gove.

257–258. Advanced Composition and Conversation. Prerequisite: 224 or equivalent. [3–3] Lowe, Gove.

289a–289b. Independent Readings. Consists of a project to be carried out under the supervision of a member of the department faculty. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed a total of 6 over a four-semester period, in both courses combined]

Hearing and Speech Sciences

CHAIR Fred H. Bess
DIRECTOR OF GRADUATE STUDIES Edward G. Conture
PROFESSORS EMERITI Russell J. Love, Jay W. Sanders
PROFESSORS Fred H. Bess, Edward G. Conture, D. Wesley Grantham, Ralph N. Ohde,
    Robert H. Ossoff, Robert T. Wertz
RESEARCH PROFESSOR Teris K. Schery
CLINICAL PROFESSOR Gary A. Duncan
ASSOCIATE PROFESSORS Daniel H. Ashmead, Stephen M. Camarata, James W. Hall III,
    Howard S. Kirshner, Judith A. Rassi, R. Edward Stone, Jr.
ASSISTANT PROFESSORS Patricia F. Allen, Gene W. Bratt, Mary Sue Fino-Szumski,
    Marleen T. Ochs, Todd Ricketts, Mary A. Schaffer, Anne Marie Tharpe,
    Wanda G. Webb, Xuefeng Yang
ASSISTANT CLINICAL PROFESSOR John R. Ashford

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

❧ MASTER'S degree programs provide for concentrated study in audiology or speech and language pathology and are supplemented by programs in early intervention and educational audiology. These programs are accredited by the Educational Standards Board of the American Speech-Language-Hearing Association.

The curriculum and practicum maintained for these programs provide each student the opportunity to meet requirements for certification by the American Speech-Language-Hearing Association and for licensure in virtually all states where licensure is required. To achieve this goal, the student must exceed the minimum requirements for the master's degree set by the Graduate School. Completion of the master's program ordinarily requires four semesters and one summer session, in most cases including an externship during the fifth semester. Those students without an undergraduate major in audiology/speech-language pathology will ordinarily take longer than 5 semesters to complete the master's degree. Master's degree students complete a total of 44 to 52 hours of course work, depending on the courses needed for certification. Students who want to earn the master's degree through a thesis option instead of clinical work leading to certification must complete at least 24 semester hours of formal course work and a research-based thesis. The thesis option must receive faculty approval.

The Ph.D. degree normally requires three years of study with a minimum of 72 graduate credit hours. There are no foreign language requirements; however, the student must complete two research projects and 12 hours of course work in statistics and research methodology prior to the dissertation. Doctoral candidates also present a minor of not less than 12 hours taken outside the department or from another subject area in hearing and speech. The final year of the program is devoted to the dissertation.

The teaching, clinical, and research programs of the department are housed primarily in Vanderbilt's Bill Wilkerson Center.

205. Survey of Speech-Language and Hearing Sciences. An introduction to the disciplines. Linguistic, acoustic, and physiological bases for human communication and its disorders. Survey of academic, research, and clinical aspects of the profession. No graduate credit for students within the Division of Hearing and Speech Sciences. [3] (Not currently offered)

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 Division of Hearing and Speech Sciences. SPRING. [3] Ohde.

207. Introduction to Hearing Science. Introduction to acoustics, psychoacoustics, and the anatomy and physiology of the peripheral and central auditory system. Course is open to graduate students in Hearing and Speech Sciences, as well as undergraduate and graduate students in other departments. SUMMER. [2] Ochs. (Not currently offered)

217. Hearing Disorders and Assessment. An introduction to the major pathologies of the peripheral and central auditory system as well as the medical/surgical treatment of those pathologies, followed by an introduction to the equipment and procedures used to assess auditory function in patients of all ages. SPRING. [3] Ochs.

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] Staff.

301. Acoustics and Perception of Speech and Speech Disorders. An examination of the processes of speech production, acoustics, and perception. Emphasis on relevant literature and research techniques in speech science. FALL. [3] Ohde.

302. Hearing Science. A discussion of basic acoustics as it applies to hearing science. Anatomy and physiology of the peripheral and central hearing mechanism and vestibular system. FALL. [3] Ochs.

303. Grammatical Analysis of Child Language. The structure of the English language, with emphasis on analysis. Description of adult grammatical constituents and grammatical analysis of child language. [3] Camarata. (Not currently offered)

304. Child Language Acquisition. The components and processes of normal language development. Relation to social and cognitive aspects of child development. Survey of developmental psycholinguistic research. FALL. [2] Camarata.

305. Clinical Principles and Procedures. Presentation and demonstration of clinical principles and procedures applicable in communication sciences and disorders. FALL. [2] Staff.

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. [4] Camarata.

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.

309. Clinical Phonetics. Descriptive, articulatory, and acoustic phonetics. Transcription of normal and disordered speech patterns using the International Phonetic Alphabet. [2] (Not currently offered)

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] Bratt.

311. Stuttering. Significant research in the field of stuttering, with emphasis on etiology and therapy. The management of fluency disturbances. SPRING. [3] Staff.

312. Speech and Language Development for the Acoustically Disabled. Theories and problems encountered in the development of speech and language in acoustically disabled children. [3] Staff. (Not currently offered)

313. Seminar: School Age Language Disorders. The language development of the school-aged student. Development of the appropriate instructional strategies and materials for use with the mildly language/learning disabled student. The role of the speech-language pathologist in the consultant and/or team teaching process. SPRING. [2] Hausman.

314. Articulation Disorders and Clinical Phonetics. The etiology, evaluation, and management of articulatory defects in children and adults. Prerequisite: consent of instructor. FALL. [4] Ohde.

316. Motor Speech Disorders. A study of the nature and treatment of the adult and childhood dysarthrias and dyspraxias of speech. Management of infants and young children at neurological risk for developing motor speech disability. Rights of the severely communicatively disabled. Prerequisite: 300 or consent of instructor. SUMMER. [3] Wertz.

317. Seminar: Cognitive/Communicative Disorders in 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 and 331 or consent of instructor. FALL. [3] Casey.

318. Rehabilitation of the Hearing Impaired. A survey of approaches to aural rehabilitation for children and adults. An introduction to functional evaluation of hearing disability. FALL. [3] Tharpe.

319. Dysphagia. The study of the normal and disordered swallow in pediatric and adult populations. Anatomy and physiology, videofluoroscopic and other assessment procedures, as well as various treatment alternatives and techniques are included. FALL. [3] Staff.

320. Speech Disorders in Craniofacial Anomalies. The etiology, diagnosis, and management of speech defects associated with craniofacial anomalies, with major emphasis on cleft palate. FALL. [2] Staff.

321. Seminar: Intervention for Pediatric Acquired Brain Injury. Assessment and intervention techniques for cognitive/communicative and behavioral deficits associated with pediatric acquired brain injuries. Emphasis on effects on normal development, educational curricula modifications and teacher/family training. Prerequisite: 317 or permission of instructor. SUMMER. (3) Allen.

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. SPRING. [3] Tharpe.

328. Psychoacoustics. Psychoacoustic theory and methods. Auditory perception in normally hearing and hearing impaired subjects. SUMMER. [2] Ochs.

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] Hall.

331. Aphasia. The study of aphasia in adults, including the neuronanatomical basis, etiologies, symptomatology, assessment, differential diagnosis, and treatment. SPRING. [3] Webb.

332. Pathology of the Auditory System. Auditory pathologies resulting from genetic origin, disease, injury to the ear, and lesions of the nervous system. SPRING. [3] Bratt.

334. Seminar in Neurogenic Communication Disorders. Research literature on the relationship between brain and speech-language performance, emphasizing current methodology for studying neurological speech and language disorders. Prerequisite: 300 or 331 or consent of instructor. FALL. [2] Staff.

335. Seminar in Augmentative Communication. The application of augmentative communication devices to patients with physical and/or cognitive disabilities. The various types of devices available, the techniques for selecting and applying these systems to individual patients, and specific information on how to achieve effective conversational use of such systems. FALL. [2] Staff.

336. Voice Disorders. Theories of voice production, with emphasis upon underlying mechanisms which cause vocal defects. Procedures for group and individual management. SUMMER. [3] Ashford.

338. Research Methods in Communicative Disorders. Research techniques and procedures. Analysis of research examples from the literature. Study of design of experiment, data collection, statistical analysis, and presentation of research findings. SPRING. [2] Camarata.

340. Amplification for the Hearing Impaired I. Background and development of the design of hearing aids, earmold acoustics, electroacoustic characteristics, performance standards and measurement techniques, clinical selection and evaluation procedures. FALL. [2] Peek.

341. Seminar in Audiology. Significant literature in the field of audiology. Directed study in assigned subject areas. FALL, SUMMER. [2] Staff.

342. Advanced Audiologic Evaluation II. Central auditory assessment. Selected neurophysiology clinical procedures in audiology, including otoacoustic emissions, auditory middle-latency, late and P300 responses and brain mapping, somatosensory and visual evoked responses, electroneuronography, and OR/ICU neuromonitoring. Practicum required. FALL. [3] Hall.

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 fund raising. FALL. [2] Bess.

345. Amplification for the Hearing Impaired II. Advanced topics in amplification including: advanced probe microphone techniques, single and multi-channel compression sys-

tems, analog and digital signal processing, and current and emerging prescriptive and fitting verification methods. SPRING. [3] Trine.

346. Vestibular Science and Evaluation. Structure, function, pathology, and evaluation of the vestibular system, including review of medical, surgical, and rehabilitative management approaches. Practicum experience includes electronystagmography (ENG), vestibular autorotational testing (VAT), and rotary chair vestibulography. FALL. [2] Trine.

347. Psychology and Education of the Deaf. History of education of the deaf. Research literature on the effects of hearing impairment on the social, intellectual, and psychological development of the individual. Societal reactions to deafness. [3] (Not currently offered)

348. Audiology in Education. (Also listed as Special Education 2600) Current issues and trends concerning the role of the audiologist in the public school setting. Emphasis on early identification and intervention, inservice education, amplification, and the roles of federal, state, and local agencies in providing services to the hearing-impaired school-age population. SPRING. [3] Fino-Szumski

349. Laboratory: Audiology in Education. Demonstration and hands-on experience with personal and classroom amplification systems. Operation and troubleshooting of amplification systems commonly used in a classroom setting. Specifically, hearing aids, FM systems, assistive listening devices, vibrotactile devices, and cochlear implants will be demonstrated. Co- or prerequisite: SPED 2600 or HRSP 2600. FALL. [1]

351. Special Problems in Speech Pathology. Areas and problems not included in other courses in speech pathology, chosen to fit the students' interests and the needs of their programs. May be repeated to a total of 12 hours. FALL, SPRING, SUMMER. [Variable credit: 1–6] Staff.

352. Special Problems in Audiology. Areas and problems not included in other courses in audiology, chosen to fit the students' interests and the needs of their programs. May be repeated to a total of 12 hours. FALL, SPRING, SUMMER. [Variable credit: 1–6] Staff.

353. Auditory Prostheses. Design and evaluation of auditory prostheses for listeners with hearing loss. Theoretical and clinical considerations of cochlear and auditory brainstem implants as well as hearing aids from a prostheses perspective. FALL. [3] Trine.

354. Seminar in Multidisciplinary Service to Children with Cochlear Implants. Current issues in the medical, audiological, speech/language, and educational management of children with cochlear implants. Emphasis on multidisciplinary team function. Spring (3) Tharpe. Prerequisite: consent of instructor. Intended for undergraduates in Deaf Education and graduate students in Hearing and Speech Sciences.

355. Clinical Internship/Externship in Speech-Language Pathology. Sequence of clinical practicum placements over five semesters for speech-language pathology majors in clinical track. Designed to meet supervised-practicum requirements for eventual certification by American Speech-Language-Hearing Association. Sequence of initial part-time internship placements in campus and other local facilities, followed by a full-time externship placement at one of many selected sites throughout the country or abroad. SPRING. [7] Rassi and Staff.

356. Clinical Internship/Externship in Audiology. Sequence of clinical practicum placements over five semesters for audiology majors in clinical track. Designed to meet supervised-practicum requirements for eventual certification by American Speech-Language-Hearing Association. Sequence of initial part-time internship placements in campus and other local facilities, followed by a full-time externship placement at one of many selected sites throughout the country or abroad. SPRING. [7] Rassi and Staff.

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. [2] Staff.

359. Audiometric Instrumentation and Calibration. An introduction to fundamental concepts in electronics and computer science and to instrumentation used in the hearing clinic or research laboratory for producing, measuring, and analyzing audio signals. Standards and procedures for calibration measurements, with practical hands-on experience. [3] Staff. (Not currently offered)

361. Principles of Counseling and Interviewing in Communication Disorders. 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. FALL. [3] Rassi.

369. Master's Thesis Research. [0]

371a–371b. Research Design and Statistical Analysis. Covers topics in research design and statistics for students preparing for research careers in hearing science, speech science, and communication disorders. Reviews mathematical bases for probability theory and statistical inference. Covers fundamental parametric and nonparametric statistical tests, with extensive discussion of research design in the context of analysis of variance. Presents statistical properties of psychophysical methods and signal detection theory. [3–3] Ashmead.

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] Hall. (Not currently offered)

376a–376b. Experimental Otolaryngology. Clinical and/or research participation in otolaryngology medical clinics, temporal bone bank, cochlear physiology. [2–2] Schwaber (Otolaryngology, School of Medicine). (Not currently offered)

379. Advanced Seminar in Audiology. A doctoral-level course focusing on special topics of interest to faculty and students based on recent research developments in audiology. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [3] Staff.

380. Advanced Seminar in Speech Pathology. A doctoral-level course focusing on special topics of interest to faculty and students and based on recent research developments in speech pathology. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [3] Staff.

381. Advanced Seminar in Language. A doctoral-level course focusing on special topics of interest to faculty and students and based on recent research developments in language. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [3] Staff.

382a–382b. Seminar: Research in Audiology. An advanced study of research for the second-year doctoral student. Directed individual research culminating in oral presentation and a manuscript. Prerequisite: consent of instructor. [2–2] (Offered on demand)

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, com-

puter-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. [3] Grantham. (Offered on demand)

386. Instrumentation for Hearing and Speech Sciences: C Programming with Real-Time Applications. An introduction to the standard C 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 C (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 C programming to real-time laboratory problems. Prerequisite: 385. [3] Grantham. (Offered on demand)

388. Independent Study and Readings in Speech Pathology. FALL, SPRING, SUMMER. [3]

389. Independent Study and Readings in Audiology. FALL, SPRING, SUMMER. [3]

399. Ph.D. Dissertation Research.

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

History

CHAIR Simon Collier
DIRECTOR OF GRADUATE STUDIES James A. Epstein
PROFESSORS EMERITI Howard L. Boorman, Charles F. Delzell, Dewey W. Grantham,
    J. León Helguera, Douglas E. Leach, Frederick D. Schneider, V. Jacque Voegeli,
    Donald L. Winters
PROFESSORS Simon Collier, Paul K. Conkin, Dennis Dickerson, Don H. Doyle,
    Robert Drews, James W. Ely, Jr., James A. Epstein, Jimmie L. Franklin,
    Hugh Davis Graham
ADJUNCT PROFESSOR Ronald Messier
ASSOCIATE PROFESSORS Michael D. Bess, David Lee Carlton, Joyce E. Chaplin,
    Marshall C. Eakin, Joel F. Harrington, Jane Gilmer Landers, Samuel T. McSeveney,
    Matthew Ramsey, Thomas Alan Schwartz, Helmut Walser Smith, Margo Todd,
    Arleen M. Tuchman, Francis W. Wcislo
ASSISTANT PROFESSORS William L. Caferro, Katherine Crawford, Yoshikuni Igarashi,
    Laura A. McDaniel, Elizabeth R. Rose
SENIOR LECTURERS Yollette Trigg Jones, William S. Longwell

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

❧ A THESIS is required for the master's degree in history; students specializing in continental European or Latin American history must achieve reading competence in one foreign language.

The Ph.D. degree program includes at least 45 hours of formal course work. A reading knowledge of one foreign language is required. Students specializing in continental European or Latin American history must demonstrate a reading knowledge of one or more additional languages essential to their research.

Certain courses offered by other programs and by the School of Law 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.

201. Science and Society before the Enlightenment. The intellectual, philosophical, and social factors influencing the development of scientific theories from the Greeks to the Enlightenment, focusing on the period from 1500 to 1800. [3] (Not currently offered)

202. Science and Society after the Enlightenment. The intellectual, philosophical, and social factors influencing the development of scientific theories since the Enlightenment. SPRING. [3] (Not currently offered)

204. History of Medicine, 1750 to the Present. The scientific, technological, cultural, and professional factors influencing the rise of medicine. Emphasis on the period since about 1750 in both Europe and America. [3] (Offered 2000/01)

205. Historical Perspectives on Women, Health, and Sexuality. Women as patients and healers. Emphasis on America. 1750 to the present. Topics include women's diseases and treatments, changing definitions of "woman," sexuality, childbirth, birth control, abortion, midwives, nurses, and doctors. [3] (Not currently offered)

206. Medicine, Culture, and the Body. (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. [3] (Not currently offered)

207. History of the Ancient Near East. (Also listed as Classics 207) 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] (Not currently offered)

208. History of Greece to Alexander the Great. (Formerly 208a; also listed as Classics 208) The Greek world from the beginning of the Mycenaean Age (1650 BC) to the end of the Classical period. Special attention to the relationship between political history and the development of Hellenism. FALL. [3] Drews.

209. Greece and the Near East from Alexander to Theodosius. (Formerly 208b; also listed as Classics 209) 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] Drews. (Not currently offered)

210. History of the Roman Republic. (Formerly 209; also listed as Classics 212) The growth and evolution of the Roman world, from the foundation of the city in the seventh century B.C. to the reign of Caesar Augustus. The Romans' unification of Italy, conquest of the

Mediterranean and western Europe, adoption of Hellenism, and overthrow of the Republic. No credit for students who have taken the former 209. FALL. [3] Drews.

211. History of the Roman Empire. (Formerly 209; also listed as Classics 213) The Roman world from Augustus to the collapse of the western empire in the fifth century. Political, military, social and religious history. Special attention given to problems arising from use of the primary sources as well as to controversies in modern scholarship. No credit for students who have had 209. SPRING. [3] McGinn (Classics)

212. Medieval Europe, 300–1000. (Formerly 211a) Rome, Latin Christendom, and the East; political events and the adaptation of Roman and Christian traditions to the needs of society emerging from the invasions. FALL. [3] Caferro.

213. Medieval Europe. 1000–1350. (Formerly 211b) Economic expansion and the formation of national states; the medieval Church and the revival of learning in the twelfth and thirteenth centuries. SPRING. [3] Caferro.

214. Europe in the Age of the Renaissance. 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. [3] Harrington. (Not currently offered)

215. Europe in the Age of the Reformation, 1500–1648. 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. FALL. [3] Harrington.

216. Europe in the Age of Absolutism, 1648–1789. The rise of the absolute state and popular revolt in the seventeenth century with emphasis on France and Spain. Dutch history, mercantilism, and international conflicts. The Enlightenment viewed especially from the standpoint of Enlightened Despotism. [3] Crawford. (Not currently offered)

218. Europe in the Age of Revolution, 1789–1815. 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. FALL. [3] Ramsey.

220. Europe in the Nineteenth Century. Major political, social, economic, and cultural developments from 1815 to 1914. SPRING. [3] Ramsey.

225. Europe From World War I to World War II. Political, socioeconomic, cultural, and colonial history of Europe from the 1914 to the fall of Hitler. FALL. [3] Bess.

226. Europe since 1945. 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. SPRING. [3] Bess.

227. Intellectual History of Early Modern Europe. The significant intellectual developments of early modern Europe in relation to their social, political, and economic background. Selected individual contributions to philosophy, political theory, literature, and science. FALL. [3] Crawford.

228. Intellectual History of Europe. Major intellectual and cultural developments since the French Revolution. Emphasis on political and social thought, with some attention to science, philosophy, literature, and the arts. [3] Ramsey. (Not currently offered)

231. History of Germany in the Twentieth Century. (Formerly 230b) The turbulent history of Germany, as it went from authoritarian state to volatile democracy, to National Socialist

dictatorship, to divided country, and to reunification. Special emphasis placed on the Nazi dictatorship, its origins and legacy. No credit for students who have completed 230b. SPRING. [3] Smith.

232. History of Modern Italy. Survey of Italian political, socioeconomic, cultural, and colonial history from 1800 to the present. The Risorgimento, national unification, Liberal Monarchy, Fascism, and the Republic. FALL. [3] Bess.

234. History of France from the Renaissance to the Enlightenment. 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. FALL, SPRING. [3] Staff.

235. Modern France. From the French Revolution of 1789 to the present. Emphasis on politics, with some attention to the major economic, social, cultural, and intellectual developments. SPRING. [3] Ramsey.

237. Russia: Tsardom to Empire. (Formerly 237a) Russian history from fifteenth-century Muscovite state, society, and economy; orthodox Russian culture and religion; Peter the Great and Catherine the Great; eighteenth century absolutism, empire, serfdom, and intellectual life. FALL. [3] Wcislo.

238. Russia: Old Regime to Revolution. (Formerly 237b) 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. [3] Wcislo. (Not currently offered)

239. Russia: The U.S.S.R. and Afterward. (Formerly 238) Russian history since the 1917 Revolution. Overview of the old regime; revolution and civil war; the Soviet "Roaring 20s"; Stalinism and the totalitarianized society; World War II; postwar Soviet society and culture; de-Stalinization and the sixties generation; Gorbachev, *perestroika*, and disintegration; contemporary history. [3] Wcislo. (Not currently offered)

240. Medieval and Early Modern England. (Formerly 240a) Cultural, political, legal and religious developments in England from its Romano-Celtic antecedents through the seventeenth century. [3] Todd. (Not currently offered)

241. Culture and Conflict in Modern Britain. (Formerly 240b) Moments of contention—cultural, political, and social—in Modern Britain (eighteenth century to the present). SPRING. [3] Epstein.

242. England under the Tudors. (Formerly 241) Political, religious, and cultural history of England from Henry VII's accession to the death of Elizabeth I. Emphasis on the Protestant Reformation and its effects; the interaction between monarchy and parliaments; Puritans and other dissenters; Elizabethan literature, drama, art and music; popular culture; and the witch craze. [3] Todd. (Not currently offered)

243. Britain's Century of Revolution. Politics, religion, and culture of the British Isles in the seventeenth century. Analysis of the Civil War, Republic and Cromwellian Protectorate, Restoration, Glorious Revolution, and the political theory sparked by these conflicts, including works of Milton and Marvell, Hobbes and Locke; arts and literature; scientific revolution and intellectual change; witch craze; beginnings of empire. SPRING. [3] Todd.

245. Victorian England. Cultural values, liberal reform; urbanization; women and gender; imperialism. FALL. [3] Epstein.

247. Themes in Modern Chinese History. Intensive reading, discussion, and short papers on selected themes in Chinese social and cultural history. Particular topics vary from semester to semester. May be taken more than once if there is no overlap with a prior offering. FALL. [3] McDaniel.

248. China in Revolution. (Formerly 255) Examination of the political, economic, social, and cultural roots for major reform and revolutionary movements in the twentieth century, including the 1911 Revolution, the May Fourth Movement, the Communist takeover, the Cultural Revolution, Democracy Wall, and the Tiananmen student protests. [3] McDaniel. (Not currently offered)

249. History of Modern Japan. (Formerly 257) The political, social, economic and cultural history of Japan in the nineteenth and twentieth centuries. Radical changes in the state, society, and economy and the effects of these changes on Japan's place in the world. FALL. [3] Igarashi.

250. Cultural and Social History of Japan's Recent Past. Japanese culture and society from the 1930s to the present. Impact of war experiences on postwar Japan, and the political nature of cultural production. SPRING. [3] Igarashi.

253. Subsaharan Africa: 1400–1800. Pre-colonial history of West and Central Africa: the rise of early empires, cultural history of major groups, the spread of Islam, the Atlantic exchange, development of the Atlantic plantation complex, and the slave trade. [3] Landers. (Not currently offered)

254. Africa since 1800: The Revolutionary Years. Political, economic, and social patterns in Subsaharan Africa from 1800 to the present. The transition from traditional states and societies, through the colonial interlude and the quest for independence, to the modern national setting with its problems of development. Emphasis on the peoples of Nigeria and South Africa. [3] Longwell. (Offered 2000/01)

255. The Islamic World to 1798. (Formerly 251) History of the Islamic world, sixth century A.D. to 1789. The rise and spread of Islam as a world empire, a religious system, a cultural-economic network, and a way of life. Historical and literary sources and artifacts. FALL. [3] Messier.

256. Nationalism and Islam in the Middle East since 1881. (Formerly 252) Secular nationalism and the changing nature of Islamic identification in the Middle East with emphasis on Egypt, Turkey, Iran, and Palestine/Israel. SPRING. [3] Longwell.

258. Rise of the Iberian Atlantic Empires, 1492–1700. (Formerly 258a) Pre-Columbian societies; the formation of the early Spanish state and imperial expansion in the Americas; the formation of multiethnic transatlantic societies. FALL. [3] Landers.

259. Decline of the Iberian Atlantic Empires, 1700–1820. (Formerly 258b) Reorganization of the Spanish and Portuguese empires; maturation of transatlantic societies; revolutions for independence. [3] Landers. (Not currently offered)

260. History of Portugal and the Portuguese Empire, 1415–1975. Portugal and its empire in Africa, Asia, and America; decline of the empire after 1600; political turmoil of the nineteenth-century; colonial wars dictatorship, and democracy in the twentieth century. [3] Eakin. (Not currently offered)

261. Colonial Mexico. (Formerly 261a) The cultural history of major pre-Columbian groups; the conquest and settlement by the Spaniards; colonial society through independence in 1821. No credit for students who have completed 261a. [3] Landers. (Not currently offered)

262. Modern Mexico. (Formerly 261b) 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. [3] Collier. (Not currently offered)

263. Southern South America since 1800. The political, social, and economic history of Argentina, Chile, and Uruguay from the end of colonial times to the present. The formation and consolidation of nation-states; the export booms of 1800–1930; industrial advance and mass politics; military dictatorships and the return to open markets. [3] Collier. (Not currently offered)

264. Brazilian Civilization. From pre-Columbian times to the present. Class and fusion of Portuguese, Amerindian, and African cultures; sugar and slavery; independence and empire; the coffee economy; race relations; the search for national identity; industrialization; dictatorship and democracy in the twentieth century. FALL. [3] Eakin.

265. Central America: From Conquest to Revolution. Iberian and Amerindian background, colonial society; independence; growth of the plantation economy; the United States' presence; political and social revolutions in the twentieth century. [3] Eakin. (Not currently offered)

266. Reform and Revolution in Latin America. 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. SPRING. [3] Eakin.

267. The Frontier in Early America: War and Cultural Interaction. (Also listed as American Studies 270; formerly 270) Frontiers in North America, 1500–1763. War, trade, and cultural exchange among the native, British, French, and Spanish residents of North America. The meaning of cultural frontiers and of cycles of peace and war in borderlands. [3] Chaplin. (Not currently offered)

268. The English Atlantic World, 1500–1688. (Formerly 271a) 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. [3] Chaplin. (Not currently offered)

269. Cultural History of the First British Empire, 1707–1783. (Formerly 271b) The creation of Great Britain; expansion of British overseas interests in America, Africa, Asia, and the Pacific; development of creole cultures; British imperial policy and transatlantic cultures; the American Revolution and growth of antislavery. [3] Chaplin. (Not currently offered)

270. The Emergence of American Democracy. (Formerly 272b) The age of Jefferson and Jackson. The second party system, the market revolution, democratic culture, territorial expansion, the slavery crisis and challenges to national unity. [3] (Not currently offered)

271. The Era of Reform. Reform movements in the United States from 1800 to the 1870s. Antislavery, temperance, feminism, communities, peace, labor, schools, asylums, and penitentiaries. Religious and secular backgrounds, Anglo American links, legacies, and consequences. [3] (Not currently offered)

272. The U.S. in the Era of the Civil War. (Formerly 273) Sectional conflict, secession, the Southern War for Independence, and Reconstruction; 1850–1877. [3] McSeveney. (Offered 2000/01)

273. The Emergence of Modern America. (Formerly 274a) Industrialization, immigration, and politics; 1877–1916. [3] McSeveney. (Not currently offered)

274. The United States, 1916–1945. (Formerly 274b) American involvement in World War I, war and peace in the 1920s; the Great Depression, the New Deal, and World War II. [3] McSeveney. (Not currently offered)

275. Recent America: The United States since 1945. A general study of the postwar period, with particular attention to the dynamics of social and political change. SPRING. [3] Graham.

276. The Old South. (Formerly 278a) 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. FALL. [3] Carlton.

277. The New South. (Formerly 278b) The aftermath of war and emancipation and the era of Reconstruction; social change and dislocation in the late nineteenth century; the Populist Revolt; the origins of segregation and one-party politics; twentieth-century efforts to modernize the region; the economic, political, and Civil Rights revolutions of the mid-twentieth century; the South in modern American society and politics. [3] Carlton.

278. History of Appalachia. (Also listed as American and Southern Studies 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. SPRING. [3] Carlton.

279. African American History to Reconstruction. (Formerly 279a) The political, socioeconomic, and intellectual history of African American people from their African backgrounds to the end of Reconstruction. Special emphasis upon the institutional history of the African American community. FALL. [3] Jones.

280. African American History since Reconstruction. (Formerly 279b) The political, socioeconomic, and intellectual history of African American people from the end of Reconstruction to the present. Special emphasis upon African American cultural and institutional history and the twentieth-century protest movements. SPRING. [3] Franklin.

281. The U.S. and the Vietnam War. (Also listed as American Studies 281) Origins of American involvement, the reasons for escalation, and the Vietnamese response to intervention. The impact on America's domestic politics, the growth of the anti-war movement, and the economic, social, and cultural effects of the conflict. SPRING. [3] Schwartz.

282. The U.S. and the World. (Formerly 280a) From the winning of independence to the Great Depression. Relationships among foreign policy, ideology, domestic politics, and social and economic change. No credit for students who have completed 280a. FALL. [3] Schwartz.

283. The U.S. as a World Power. (Formerly 280b) 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. No credit for students who have completed 280b. [3] Schwartz. (Offered 2000/01)

284. American Social History to 1865. (Formerly 284a) The social causes and consequences of such events as the American Revolution and the Civil War. The impact of industrialization and urbanization on the elite, labor, immigrants, blacks, women, and the family. [3] Doyle. (Offered 2000/01))

285. American Social History since 1865. (Formerly 284b) The social causes and consequences of such events as Progressive Reform and the Great Depression. The impact of industrialization and urbanization on the elite, labor, immigrants, blacks, women, and the family. FALL. [3] Dickerson.

286. Women's Experience in America: Colonial Times to the Civil War. Women's status in law, politics, and the economy; witchcraft trials and religious deviance; education and domesticity; women's social service and reform projects; early industrial and frontier experiences; the emergence of the women's rights movement. FALL. [3] Rose.

287: Women's Experience in America: The Civil War to the Present. Industrialization; women's reform movements; women's efforts to achieve equality in law, education, politics, and the professions; women's work in the World Wars and the Depression; the emergence of modern feminism. SPRING. [3] Rose.

288: History of American Thought from the Puritans to the Civil War. (Formerly 285a) Basic beliefs and preferences, with special emphasis upon Christian doctrine and political and economic theory. Understanding of the origins of a largely Christian, republican, and capitalist America. FALL. [3] Conkin.

289: History of American Thought since 1865. (Formerly 285b) Basic beliefs and preferences, with special emphasis upon Darwinian theory, the physical sciences, classic American philosophers, and the various and confusing intellectual fashions of the twentieth century. [3] (Not currently offered)

292. Historical Geography of the United States. Historical approach to the physical, political, economic, and cultural geography of the United States. This map-oriented course will integrate issues of space and time and incorporate insights from the new field of environmental history. [3] (Not currently offered)

294. Selected Topics in History. FALL, SPRING. [3]

300a–300b. Introduction to Historical Methods and Research. [3–3] Smith, Chaplin.

309. Studies in the Philosophy of History. FALL. [3] Conkin.

315a. Studies in Early Modern European History. SPRING. [3] Harrington

320a. Studies in European History, 1815–1914. [3] (Not currently offered)

321. Topics in European History. [3] (Not currently offered)

324a. Studies in Recent European History. [3] (Not currently offered)

330a. Studies in German History. [3] (Not currently offered)

340. Urban History. Theoretical approaches to the dynamics of urban life in different historical times and places. Topics of special interest include rural-urban linkages; merchants and the state; plebeian culture and patrician society; the languages of class and gender; the myths and rituals of marginality; race and ethnicity; and global metropolitanism. [3] McDaniel.

343a. Studies in Early Modern Britain. [3] Todd. (Not currently offered)

343b. Seminar in Early Modern Britain. [3] Todd. (Not currently offered)

344a. Studies in Modern England. FALL. [3] Epstein.

344b. Seminar in Modern England. [3] (Not currently offered)

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. [3] (Not currently offered)

361. Topics in Latin American History. FALL. [3] Landers.

365. Seminar in Latin American History. SPRING. [3] Collier.

369. Master's Thesis Research. [0]

371a. Studies in Early American History to 1783. [3] (Not currently offered)

372a. Studies in the Middle Period of American History, 1783–1861. [3] (Not currently offered)

372b. Seminar in the Middle Period of American History, 1783–1861. [3] (Not currently offered)

374a–374b. Studies in Recent American History. [3–3] (Not currently offered)

375. Seminar in Recent American History. [3] Graham. (Not currently offered)

378a. Studies in the History of the South. SPRING. [3] Carlton.

380a. Studies in American Diplomatic History. FALL. [3] Schwartz.

381. Topics in American History. FALL. [3] Dickerson

384a. Studies in American Social History. [3] (Not currently offered)

384b. Seminar in American Social History. [3] (Not currently offered)

385a–385b. Studies in the Intellectual History of the United States. [3–3] (Not currently offered)

386a. Studies of Women in the United States. [3] Rose. (Not currently offered)

390a–390b. Independent Study. [Variable credit: 1–3 each semester]

398. Dissertation Seminar. [3] Todd.

399. Ph.D. Dissertation Research. [3]

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

Interdisciplinary Studies

320a–320b. Foundations of Social and Political Thought.

Interdisciplinary study of a theme in social and political thought as reflected in the disciplines of comparative literature, English, history, philosophy, political science, and sociology. The first semester focuses on how the theme is treated within these disciplines; the second, on how the study of the theme is treated within these disciplines. FALL, SPRING. [3–3] Graham and Staff.

Japanese

LECTURER Hideko Shimizu

❧ 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.

201–202. Beginning Modern Japanese. 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. [5–5] Staff.

211–212. Intermediate Modern Japanese. Emphasis on reading. Also included are syntax, writing, translation, and conversation. Prerequisite: 201–202. [5–5] Staff.

241–242. Third-Year Japanese. Readings in contemporary Japanese texts. Advanced conversation and discussion. Prerequisite: 211–212 or equivalent. [3–3] Staff.

251–252. Fourth-Year Japanese. Readings in advanced Japanese cultural, literary, and historical texts. Prerequisite: 241–242 or equivalent. [3–3] Staff.

289a–289b. Independent Study. A reading course which may be repeated with variable content according to the needs of the individual student. Primarily designed to cover materials not otherwise available in the regular curriculum. FALL, SPRING. [Variable credit: 1–3]

Latin American and Iberian Studies

DIRECTOR James J. Lang
PROFESSORS EMERITI J. Richard Andrews, John L. Bingham, J. León Helguera, Ronald Spores
PROFESSORS Simon Collier, Arthur A. Demarest, Earl E. Fitz, Leonard Folgarait, Thomas A. Gregor, Russell G. Hamilton, Cathy Login Jrade, William Luis, Andrea Maneschi, Christopher H. Maurer, C. Enrique Pupo-Walker, Philip D. Rasico, Francisco Ruiz-Ramón
ASSOCIATE PROFESSORS Victoria A. Burrus, Marshall C. Eakin, William R. Fowler, Jr., Wendy A. Hunter, Jane Gilmer Landers, James J. Lang, John D. Monaghan, Kurt Weyland
ASSISTANT PROFESSORS Fräncille Bergquist, Edward F. Fischer, Annabeth Headrick, John Janusek, Andrés Zamora
SENIOR LECTURERS Ramón Jrade, Elena Olazagasti-Segovia

DEGREE OFFERED: LATIN AMERICAN STUDIES. `Master of Arts`

❧ THE Center for Latin American and Iberian Studies offers an interdisciplinary program of graduate instruction in Latin American studies in cooperation with the departments of Anthropology, Economics and Business Administration, Fine Arts, History, Political Science, Sociology, and

Spanish and Portuguese. Related faculty represent six of the University's other schools, Divinity, Education, Engineering, Law, Management, and Medicine. Participating 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 Dean for Graduate Studies. Master's degree candidates are expected to demonstrate language ability in both Spanish and Portuguese; this means advanced ability in one of the two languages and intermediate ability in the other.

Students combining a master's degree from a related discipline with a minor in Latin American studies select area courses as their minor and must fulfill the Center's language requirement of a reading and speaking knowledge of either Spanish or Portuguese. Doctoral candidates with a minor in Latin American studies must have a reading and speaking competence in either Spanish or Portuguese and a technical reading knowledge of the other. 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 and demonstration of language competence.

A joint Master of Arts and Master of Business Administration degree program is available. Students must apply to and be accepted by both the Graduate School and the Owen Graduate School of Management. 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 and Iberian Studies.

Latin American Studies 201. Introduction to Latin America. A multidisciplinary survey of Latin America from pre-Columbian times to the present emphasizing culture, economic and political patterns, social issues, literature, and the arts in a historical perspective. SPRING. [3] Eakin.

Latin American Studies 234. Twentieth-Century Mexican Literature, Film, and Art. (Also listed as Fine Arts 234) The historical, social, and political dynamic as expressed in various art forms. The relation between social reality and aesthetic form. [3] Folgarait (Fine Arts).

Latin American Studies 290. Interdisciplinary Research Methods. Principal research methods and sources necessary for the study of Latin America in the social sciences and humanities. FALL. [3] Covington. (History), Fowler (Anthropology).

Latin American Studies 294a. Special Topics in Latin American Studies. Selected special topics suitable for interdisciplinary examination from the perspective of the social sciences and humanities, as announced in the *Schedule of Courses*. [3] (Not currently offered)

Latin American Studies 369. Master's Thesis Research. [0]

Latin American Studies 390a–390b. Independent Study. A program of independent readings and research in a minimum of two disciplines, to be selected in consultation with the center's graduate adviser. FALL, SPRING. [3–3]

See departmental listings for courses offered 1999/2000. 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; 220, Peoples and Cultures of Mexico; 226, Myth, Ritual, Belief: The Anthropology of Religion; 243, Introduction to Nahuatl Language, Culture, and Literature; 244, Intermediate Nahuatl Language, Culture, and Literature; 245, Art of Pre-Columbian America; 248, Ancient Empires and Civilizations of South America; 249, Indians of South America; 250, Shamanism and Spiritual Curing; 288a–288b, Independent Research.

ECONOMICS AND BUSINESS ADMINISTRATION: 222, Latin American Economic Development; 288, Theory and Problems of Development; 349a–349b, Reading Course; 353, Project Evaluation; 357, International Trade and Economic Development; 358a–358b, Policy Issues in Developing Economies.

HISTORY: 258,Rise of the Iberian Atlantic Empires, 1492-1700 **1492–1700**; 260, History of Portugal and the Portuguese Empire, 1415–1975; 261, Colonial Mexico; 263, Southern South America since 1800; 264, Brazilian Civilization; 265, Central America: From Conquest to Revolution; 266, Reform and Revolution in Latin America; 361, Topics in Latin American History; 390a–390b, Independent Study.

POLITICAL SCIENCE: 215, Change in Developing Countries; 217, Latin American Politics; 218, Social Reform and Revolution; 228, International Politics of Latin America; 315, Research in Latin American Politics; 316, Politics of Change in the Third World; 317, Political Development and Democratization; 323, Theories of International Politics; 325, International Political Economy; 390a–390b, Independent Study.

PORTUGUESE: 222, Culture and Civilization of Brazil; 232, Introduction to Brazilian Literature; 285, Modern Brazilian Literature; 289, Independent Study; 385, Seminar: Studies in Contemporary Literature of the Portuguese-Speaking World (Portugal, Brazil, Lusophone Africa).

SOCIOLOGY: 265, Psychological Anthropology; 277, Contemporary Latin America; 390a–390b, Directed Studies.

SPANISH: 101G, Spanish for Reading; 216, Phonology; 218, Morphology and Syntax; 230, Development of Lyric Poetry; 232, Literature of the Spanish Golden Age; 233, Modern Spanish Literature; 234, Contemporary Spanish Literature; 235, Spanish American Literature; 236, Contemporary Literature of Spanish America; 239, Development of the Novel; 240, The Contemporary Novel; 289, Independent Study; 293, Contemporary Latin American Prose Fiction in English Translation; 381, Seminar: Modern Spanish American Poetry; 386, Seminar: Contemporary Spanish American Short Story; 387, Contemporary Spanish American Novel; 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 in particular years and in closely related general courses in years in which they are taught by members of the Latin American Center faculty.

Liberal Arts and Science

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 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.

MLAS 260. Seminar in Humanities. [3]

MLAS 270. Seminar in Social Science. [3]

MLAS 280. Seminar in Natural Science. [3]

MLAS 290. Interdisciplinary Seminar. [3]

Selected Topics

MLAS 310. Selected Topics in Humanities. [3]

MLAS 320. Selected Topics in Social Science. [3]

MLAS 330. Selected Topics in Natural Science. [3]

MLAS 340. Interdisciplinary Selected Topics. [3]

MLAS 369. Master's Thesis Research. [0–3]

Linguistics

PROFESSORS Antonina F. Gove, Alice Carmichael Harris, Timothy P. McNamara,
   Philip D. Rasico
ASSOCIATE PROFESSOR Virginia Scott
ASSISTANT PROFESSORS M. Fräncille Bergquist

❧ A GRADUATE minor in linguistics is offered. For information concerning related courses, refer to the Arts and Science section of the *Undergraduate Catalog*.

200. Introduction to Language. The nature of human language. Writing systems, production and transcription of sounds of language, American dialects, English word formation, child language acquisition, language in the brain, American Sign Language, nonverbal communication, and animal communication systems. [3] (Not currently offered)

201. Introduction to Linguistics. (Also listed as Anthropology 201) 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. SPRING. [3] Harris.

202. Sociolinguistics. (Also listed as Sociology 202) The social dimension of language use. Variations in language produced by cultural, social class, sex, and age difference and by the occasion of the speech event. [3]

203. Anthropological Linguistics. (Also listed as Anthropology 203) Introduction to language in its anthropological context. Topics include theories of the origin of language, prehistory of languages and language groups, the use of vocabulary as a guide to the ways societies classify their universe, and possible deterministic interrelationships between language and culture. FALL. [3] Harris.

204. Women, Men, and Language. Language of women and men in the context of recent studies in cognition and society. Semantics, acquisition of gender-specific language behavior, and the roles of women and men in linguistic variation and change. Gender differences in conversational strategies. [3] (Not currently offered)

240. Morphology. The structure of complex words. Origins and history of selected examples in English. Analysis of data from diverse languages of the world. [3] (Not currently offered)

241. Syntax. The structure of phrases and sentences in natural languages; introduction to linguistic theory. Most examples from English; attention paid to crosslinguistic comparisons, observation, and evidence to support a conclusion. [3] (Not currently offered)

262. Historical and Comparative Linguistics. Language change, determination of relations among languages, reconstruction of parent languages, identification of original speakers of reconstructed languages and their homeland. Emphasis on the Indo-European group, but examples from other language families. [3]

289a–289b. Independent Readings. [Variable credit: 1–3 each semester, not to exceed a total of 7]

294a–294b.Selected Topics. Topics vary and are announced in the `Schedule of Courses` [3–3]

Management

ACTING DEAN Joseph D. Blackburn, Jr.

DIRECTOR OF GRADUATE STUDIES Bruce Barry

PROFESSORS EMERITI J. Dewey Daane, Thomas A. Mahoney, Samuel B. Richmond, H. Martin Weingartner

PROFESSORS Amit Basu, Joseph D. Blackburn, Jr., Robert Blanning, Germain B. Böer, Richard L. Daft, William W. Damon, Bezalel Gavish, Barry A. Gerhart, Roger D. Huang, Larry J. LeBlanc, Ronald W. Masulis, Richard L. Oliver, David L. Rados, Roland T. Rust, David T. Scheffman, Gary D. Scudder, Hans R. Stoll, Bart Victor

PROFESSORS OF THE PRACTICE William I. Henderson, Richard W. Oliver, Roxane Spitzer, Frederick Talbott, Robert A. Vraciu

ASSOCIATE PROFESSORS Clifford A. Ball, Bruce Barry, Paul K. Chaney, William G. Christie, Mark A. Cohen, Bruce Cooil, Raymond A. Friedman, Luke M. Froeb, Brian J. Gibbs, Donna L. Hoffman, Nancy Lea Hyer, M. Eric Johnson, Craig M. Lewis, Thomas P. Novak, David C. Parsley

ASSISTANT PROFESSORS Seema Arora, Amy Bonkoski, Alexander O. Brown, Tarun Chordia, Amar Gande, James A. Hill, Jr., Chris E. Hogan, Debra C. Jeter, Ann E. Schlosser

DEGREE OFFERED: *Doctor of Philosophy*

❧ THE Doctor of Philosophy degree in management is designed to prepare students for academic careers in teaching and research and for non-academic careers in business and government where the ability to conduct and communicate significant original research is necessary. Because the demand for such Ph.D.s is high, graduates find many employment opportunities. The philosophy of management education embraced by the program emphasizes the basic disciplines underlying the various fields of management. Students specialize in a particular field of management but become familiar with other management fields and their underlying disciplines. The program is small and highly selective and fosters close student-faculty interaction in an atmosphere that is congenial and intellectually challenging.

To receive the Ph.D. in management, candidates must complete 72 hours of graduate work, pass written and oral examinations, and demonstrate scholarship in a dissertation. Students without prior graduate work in management may satisfy the requirements for the Ph.D. with four years of study. Students with prior graduate work may receive transfer credit and may be able to complete the Ph.D. requirements within a shorter period. However, a minimum of two years must be spent in full-time residence at Vanderbilt.

Semesters are divided into two seven-week modules with most courses carrying 1–2 hours of credit. Courses which carry four hours of credit continue for both modules in a given semester. Students should consult the *Schedule of Courses* each semester to determine in which module a course

is offered. Each student is required to take two courses in economics and a total of four courses in mathematics, statistics, and research methodology. In addition, the student generally takes at least four additional courses in a specialization and is required to take at least two courses in an approved minor field. The Ph.D. program currently offers specializations in finance, marketing, operations management, and organization studies, but other specializations are possible through specific arrangement and petition.

Each student must pass a written preliminary examination in a basic discipline, usually by the end of the third semester. The basic disciplines are economics, quantitative methods, and behavioral sciences. The program also requires the candidate to pass a preliminary examination in the major field. This examination is generally taken at the end of the fifth semester.

Students are asked to submit a research paper before the end of the fifth semester and are encouraged to become active in the research process as early as possible. The student typically takes 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 (preferred) Graduate Management Admission Test (GMAT) as well as transcripts and letters of recommendation. Candidates are also expected to have completed course work in differential and integral calculus prior to entering the program. Financial support that covers tuition and living expenses is available for superior students.

311. Introduction to Accounting. A study of the basic concepts and limitations of financial and managerial accounting. Covers the financial reporting process and the development of financial statements for external users, such as investors and creditors and also the preparation and utilization of financial information for internal management decision making. [4] Chaney, Hogan.

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. Prerequisite: 322. [2] Arora, Parsley.

322. The Economics of Businesses, Consumers, and Markets. The class studies the behavior of consumers and firms in a market economy. Topics include bilateral bargaining, auctions, supply and demand, costs, competition, monopoly, oligopoly, the organization of firms and markets, and strategy. [2] Froeb.

331. Managerial Finance. A survey and analysis of the basic problems in corporate financial management. Under the corporate objective of shareholder wealth maximization, the

course considers capital investment analysis, financial structure, cost of capital, dividend policy, and other topics such as mergers and acquisitions, and working capital management. Explicit consideration of the risk-return tradeoff involved in the decision-making process. Prerequisite: 311, 322, 381. No credit for Ph.D. students in management. [2] Christie, Lewis.

341. Organization Management and Human Resources. Examination of the management of work organizations—strategic adaptations to changing environments, organization structures, work and task design, the dynamics of small groups, and management of individual performance. Particular attention is paid to issues of human resource staffing and motivation, leadership, communication, and decision making, all within the context of managing for effective performance and improved productivity. No credit for Ph.D. students in management. [2] Gerhart.

361. Marketing Management. Examines marketing systems and environments, strategic market planning, buyer behavior, market segmentation, forecasting, and marketing research as these relate to product, pricing, communications, and distribution decisions. course included written examinations and case analyses. Prerequisite: 322. No credit for Ph.D. students in management. [2] Gibbs, Schlosser

371. Operations Management. An overview of operations management in both service and manufacturing operations with emphasis on international operations. Topics include process analysis, quality control, queuing, enterprise planning systems, lean manufacturing, and supply chain management. Corequisite: 382. No credit for Ph.D. students in management. [2] Brown, Hill.

381. Managerial Statistics. Principles of statistical analysis and inference, including descriptive statistics, probability theory, statistical estimation, tests of hypotheses, analysis of variance, and regression and correlation analysis. Introduction to decision theory. [2] Ball.

399. Ph.D. Dissertation Research.

431. Securities and Portfolios. Considers the price behavior of risky securities and the investor's portfolio optimization problem. Topics include fixed income portfolio management, asset pricing models, and an introduction to options pricing. Prerequisite: 331. [2] Bonkoski, Chordia.

432a. Corporate Value Management. This course will focus on corporate valuation. Topics covered include the use of financial statements in developing cash flow forecasts, estimating the cost of capital, financing policy, tax effects, investment options, and managing companies to add value. Applications include: capital budgeting, mergers and acquisitions, corporate restructuring. Prerequisite: 331. [2] Gande, Lewis.

432b. Corporate Financial Policy. This course examines major financial decisions and policies of a corporation. The topics considered are dividend policy, security issuance and repurchase decisions, management compensation plans, optimal capital structure, uses of various financial instruments, bankruptcy and reorganization, going public and going private. Prerequisite: 432a. [2] Bonkoski.

433a. International Financial Markets and Investments. Assesses the international economic environment in which business and individuals operate. Financial markets examined are the foreign exchange markets, offshore financial markets, derivative markets, and international capital markets. Prerequisite: 431. [2] Huang.

433b. International Corporate Finance. Unique problems of the financial managers operating internationally are considered. Topics covered include management of foreign exchange risk, multinational capital budgeting, foreign direct investment, risk management, and international taxation. Prerequisite: 433a. [2] Gande.

435a. Equities Markets. This course deals primarily with the functioning of U.S. equity markets. Topics studied include trading costs, bid-ask spreads, regulatory issues, market efficiency, and trading anomalies. Prerequisite: 431. [2] Christie.

435b. Fixed Income Markets. Analysis of government, municipal, and corporate debt markets. Term structure of interest rates. Interest rate risk. Duration and convexity. Mortgage backed securities. Prerequisite: 431. [2] Chordia.

435c. Derivatives Markets. Analysis of futures and options markets. Structure of futures prices, hedging, risk and return in futures. Structure of option prices, option trading strategies, option valuation. Futures and options on commodities, on stock indexes, on currencies and on debt instruments will be analyzed, as well as other financial products with futures or option features. Prerequisite: 431. [2] Stoll.

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: 431. [2] Chordia.

441. Organization Design. Considers traditional and innovative designs for organizational structures and processes within business organizations. Topics include environment and structure, corporate culture, power and politics, decision making, and new organizational designs. Prerequisite: 341. [2] Daft.

442. Work Team Management. Focuses on methods of understanding and improving the performance of work teams. A holistic view of teams is obtained through combining psychological theories and current practices in contemporary business organizations. Topics include task design, team composition, member role structures, member socialization, influence and power, leadership, decision making, and training. A heavy emphasis is placed on experiential learning, including numerous case studies and a variety of team-building exercises. Prerequisite: 341. [2] Cannon.

443. Power and Influence in Organizations. Explores issues of power, powerlessness, influence, conflict, and dissent within and between various types of organizations. Through readings, discussions, films, and case studies, we examine how power and influence are gained, maintained, used, abused, and lost in the pursuit of interpersonal and organizational objectives, and consider the ethical dilemmas that underlie power issues. Prerequisite: 341. [2] Barry.

445. Human Resource Staffing. Examines organization staffing strategies. Topics include human resource planning, recruitment, job analysis, applicant assessment, equal employment opportunity, and affirmative action. Particular emphasis is given to the role of statistical analysis in designing and evaluating staffing systems. Practical exercises focus on strategically designing and evaluating staffing procedures. Prerequisite: 341. [2] Staff.

446. Motivation and Reward Systems. 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: 341. [2] Gerhart.

447. Labor Relations and Workforce Governance. This course covers the basics of labor relations, including organizing, collective bargaining, and the grievance process. It also covers the decline of unions, union responses to the decline, and alternative forms of work-place governance such as network groups, works councils, employee involvement, and non-union grievance systems. Employee rights granted by government statues are dis-cussed, along with implied contracts and alternative dispute resolution. Prerequisite: 341. [2] Friedman.

460. Advertising. This course covers the formulation of overall communications strategy and the role of advertising. Typical topics covered include targeting, creative strategy, media strategy, budgeting, assessment of communications effectiveness, and agency rela-tions. Complements Mgt. 464, Sales Promotion. Readings, cases, written case reports, and advertising lab assignments. Prerequisite: 361. [2] Rados.

461a. Marketing Research. Covers the fundamental marketing research skills of problem formulation, secondary data analysis, qualitative research, research design, questionnaire design, data collection, survey sampling, and basic data analysis. This course is oriented to the marketing manager who needs to understand the fundamental decision issues in designing marketing research and interacting with marketing research suppliers. Method of instruction is primarily lecture with some computerized statistical demonstrations. Prerequi-site: 361, 382. [2] R.L. Oliver.

461b. Marketing Research Project. This course is centered around qualitative research and field research surveys conducted by 4 to 5 person student teams. Method of survey administration can be in-store intercept, mail, phone, or electronic. The instructor will pro-vide a variety of sponsored projects, although student teams have the option of finding their own project sponsor. Method of instruction will be lectures focusing on project management and intermediate data analysis methods (cross tabulation, analysis of variance, and multi-ple regression), group work, and in-class presentations. Prerequisite: 461a. [2] Staff.

462. Buyer Behavior. A survey of the study of buyer behavior including its theoretical bases and applications to marketing management strategy. Topics include models of buyer behavior; learning and information processing; attitude and attitude change; dissonance; satisfaction and other post-purchase processes; personality and psychographics; cultural, social class, and group influences; family decision making; and adoption and diffusion of innovations. Prerequisite: 361. [2] Gibbs.

464. Sales Promotion. This course covers a variety of forms of consumer and trade pro-motions including couponing, sampling, trade allowances, and temporary price reductions. Other related topics include slotting allowances, recent attempts to reduce the amount of sales promotion, and licensing. Cases are drawn from industries that include consumer packaged goods, services, soft goods, and durables. Complements Mgt. 460, Advertising. Readings, cases, and written case reports. Prerequisite: 361. [2] Rados.

466. Pricing and Channel Management. This course covers topics in pricing, purchasing, and distribution. Purchasing is covered because effective pricing must understand pur-chasing. Distribution issues are also covered because pricing and distribution are two inter-related components of the marketing mix. Marketing and microeconomic pricing tools are introduced and utilized in a number of cases involving both industrial and consumer goods pricing. Among the topics covered are pricing of new products and services, changing the price of existing products, price and quality, product line pricing, negotiating prices with

large customers, bundling, price promotions, and yield management. Through readings, lectures, and cases, the course provides an overview of purchasing, including supplier relations as well as distribution issues, emphasizing the relationship between pricing and distribution. Prerequisite: 361. [2] Staff.

467. New Product and Service Development. Emphasizes the proactive product and service development process. Specific topics include evaluation of potential markets; identification, design, and development of new products and services consistent with customer needs; concept testing; pretest marketing; and test marketing. The course emphasizes both the qualitative and analytical tools that can aid the marketing manager in reducing the probability of new product failure and enhancing ultimate profitability. Prerequisite: 361. [2] Staff.

471. Operations Planning and Control. This course provides familiarity with state-of-the-art, computer based production planning techniques. Topics include demand forecasting, aggregate planning and scheduling, material requirements planning, theory of constraints concepts, just-in-time systems and scheduling. Prerequisite: 371. [2] Hill.

473. Simulation. Introduces the power of computer simulation as a managerial support tool. Students develop simulation models with computer graphic animation using advanced simulation software. Emphasis on application of simulation to manufacturing and service operations problems such as capacity planning, buffering and work-in-process, inventory system design (supply chain), and scheduling. Prerequisite: 371. [2] LeBlanc.

474. Operations Research. Focuses on managerial uses of optimization techniques. Includes linear and integer programming models, critical path scheduling with limited resources, multiple product inventory control for manufacturing and service industries, and learning curve calculations. Numerous applications articles are covered. Prerequisite: 371. [2] LeBlanc. (Not currently offered)

480. Business Forecasting. Topics include smoothing methods, multiple regression, and ARIMA models. Prerequisite: 382. [2] Cooil.

482. Managerial Statistics II. The emphasis is on important general forms of data analysis, basic exploratory methods, and multiple regression. Prerequisite: 382. [2] Ball.

491. Decision Support Systems. Provides experience in the construction of decision support systems using expert systems software and examines the role of the systems in the growth of intelligent, adoptive organizations. Topics include rule-based expert systems, forward and backward chaining, knowledge acquisition for intelligent systems, group decision support systems, and the impact of decision support systems on organizational intelligence. [2] Blanning.

492a. Introduction to Data Base Management Systems. Principles of data base management system development and use. Overview of different data models, methods for conceptual, logical, and physical design of data bases, issues in data base administration, advances in data base technology (distributed data bases, knowledge base systems, heterogeneous data bases). Prerequisite: consent of instructor. [2] Basu.

492b. Database Systems Management Project. This is a project course accompanying Mgt 492a; Introduction to DBMS. Students work in teams on designing integrated databases spanning multiple applications and organizational units for real or realistic organizations. The databases and applications are then implemented using relational client-server DBMS packages. Corequisite: 492a. [2] Basu.

493. Analysis and Design of Computer-Based Applications. Examination of the steps and techniques involved in the development of computer-based applications, with an emphasis on the introduction of new technologies. Topics include formal and informal organizational structure, initiation of systems projects, techniques for system investigation and analysis, tradeoffs made in the design and analysis process,and the design of dataflows, data stores, and processing procedures. [2] Blanning.

494a. Introduction to Telecommunications Management. Directed toward the consumer of telecommunications technology, with emphasis on information management. Specific topics include utilization and applications, data communications (hardware components, interfaces, and link protocols), architecture and technology (protocols, local area networks, and integrated digital services network), net management (control and security), and future directions of environmental and planning issues. Prerequisite: consent of instructor. [2] Gavish.

494b. Advanced Telecommunications Management. Covers advanced topics in telecommunications management, including fiberoptics (undersea cables and fiber to the home), photonics, ATM and frame relay, local area networks, wireless communications, network interconnections, encryption-security and privacy, and the movement from analog to digital communications. Outside speakers from the telecommunications field and related industries will be incorporated, combined with site visits. Teams of students will be required to prepare projects and present the results. Prerequisite: Mgt 494a. [2] Gavish.

495a–495b. Wireless Network and Mobility. Wireless communication systems are one of the fastest growing segments of modern economies. The dynamic changes that take place as a result of rapid introductions of new wireless technologies affect many industrial and service organizations. The course will cover the new technologies and explain the tradeoffs between different technologies, the types of services made possible through them, the economic and managerial issues involved in wireless communications, and governmental and societal issues to be addressed to ensure successful implementations. Course will cover topics such as: cellular systems, personal communication services, wireless LANs, SMR (specialized mobile radio),infrared and microwave links, satellite base communication services including Geostationary satellites, LEOS, MEOS and specialized satellite services, VSAT systems, direct broadcasting, meteor burst communication systems, and mobile (sea and land) based networks. Issues such as transmission methodologies (FDMA, TDMA, CDMA), routing, channel allocation, addressing and naming, locating mobile users, user authentication, privacy, security, bandwidth auctioning methods, and system expansion and transition over time. Prerequisite: 494 or consent of instructor. [4] Gavish.

511. Accounting for Mergers and Acquisitions. A study of advanced topics in financial accounting. Emphasis is on accounting for business combinations, including purchase and pooling of interests, consolidated financial statements, cash flows, translation of foreign financial statements, and other selected issues. Prerequisite: 311. [2] Jeter.

535a. Derivative Securities Valuation. This course examines the pricing of derivative securities. It focuses on futures, options and exotic securities. A number of valuation techniques are examined which include numerical approaches. Prerequisite: 431, 435a. [2] Lewis.

535b. Advanced Fixed Income Securities. This course examines the pricing of interest rate sensitive claims, futures, swaps, and options. It examines security pricing using a number of different models for the term structure of interest rates. A number of valuation techniques are examined. Prerequisite: 431, 435a, 535a. [2] Chordia.

539. Special Topics in Finance. Prerequisite: consent of instructor. [1–4] Staff.

539a. Topics in Finance. Financial Data Analysis. This course introduces students to the many databases used in empirical research in finance, including CRSP, Compustat, and TAQ (NYSE, Amex, and NASDAQ-NMS transaction data). The course will use the SAS System to access these databases and to analyze the data. Basic Fortran programming will also be presented to familiarize students with CRSP/Compustat access programs. The course is intended for Ph.D. students and MBAs who are interested in more analytically oriented finance positions. Prerequisite: 431. [2] Schenzler.

539d. Special Topics in Finance: Quantitative Portfolio Mgt. This course will take the perspective of a quantitatively oriented equities portfolio manager. It will examine 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. Prerequisite: 431. [2] Lewis.

549. Special Topics in Organization Studies. Prerequisite: consent of instructor. [1–4] Staff.

568. Advanced Marketing Research. Considers advanced quantitative methods for marketing research, including methods for perceptual mapping, market segmentation, conjoint analysis, and models of consumer choice. Students will learn how to apply these methodologies and clearly present their results. Considerable emphasis is given to hand-on student analysis of marketing research data, with regular student presentations and in-class discussion of results. Prerequisite: 461a–461b. [2] Novak. (Not currently offered)

569. Special Topics in Marketing. Prerequisite: consent of instructor. [1–4] Staff.

572. Management of Technology. Focuses on the strategic management of technology and innovation in established firms. The conceptual framework of the course is an evolutionary process perspective on technology strategy and innovation. The fundamental ideas underlying this evolutionary perspective are (1) that a firm's technology strategy emerges from its technological competencies and capabilities, (2) that technology strategy is shaped by external (environmental) and internal (organizational) forces, and (3) that the enactment of technology strategy, through the experience it generates, serves to further develop the firm's technological competencies and capabilities. Cases, readings and lectures are utilized. Prerequisite: 373. [2] Scudder.

573. Managing Automation. This course covers the issues of identifying, justifying, implementing and applying new technologies in manufacturing to ensure competitiveness in the global arena. Technologies covered include CIM, CAD, CAM, FMS, AI, and Expert Systems. Lectures, cases, guest speakers and readings are used. Prerequisite: 373. [2] Scudder. (Not currently offered)

576. Time-Based Competition. Response time has emerged as a critical dimension of global competition. The leading manufacturing and service firms have lean, flexible production processes that provide world-class quality and quick response while remaining cost competitive. This course examines from an operations perspective how a firm develops processes that deliver fast response to customer demands. Just-in-time and business process reengineering are examined in detail. Prerequisite: 373. [2] Staff.

579. Special Topics in Operations Management. Prerequisite: consent of instructor. [1–4] Staff.

581. Stochastic Processes. Role of stochastic modeling in finance and economics. random walks, Brownian motion, Wiener processes, Poisson processes, Merkhov chains, diffusion, martingales and Ito stochastic calculus. Applications to security pricing. Prerequisite: consent of instructor. [2] Ball.

597. Using Telecommunications and Electronic Commerce (TEC) for Competitive Advantage. We live in an era where computers and telecommunication systems are undergoing revolutionary changes. Competitive pressures and automation lead to organizational changes and restructuring which force fewer people to provide more and higher quality products and services. The main objective of the seminar is to cover these changes, learn how to analyze them, and how to exploit them for a competitive advantage. [2] Gavish.

599. Special Topics in Telecommunications and Electronic Commerce. Prerequisite: consent of instructor. [1–4] Staff.

612. Research Seminar in Accounting. Prerequisite: consent of instructor. [1–4] Staff.

630a. Asset Pricing Theory. This course rigorously develops the theoretical basis for major asset pricing models. Single period versions of the Capital Asset Pricing Model, the Arbitrage Pricing Model and the Option Pricing Model are formally developed from basic economic principles. This course may be taken in place of Management 3431. Prerequisite: consent of instructor. [2] Masulis.

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] Masulis.

631a. Empirical Methods in Finance A. 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, intertemporal equilibrium models, and market microstructure.Theoretical foundations are developed; empirical research evidence is considered; applications of models are stressed. Prerequisite: 630a, 630b. [2] Huang.

631b. Empirical Methods in Finance B. 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. [2] Lewis.

632. Advanced Finance Theory. Covers an advanced treatment of finance theory. Topics include utility theory, arbitrage and pricing, equilibrium models and complete markets, intertemporal models, continuous time finance, contingent claim pricing, and the term structure of interest rates. Prerequisite: 630a–630b. [4] Ball.

635. Independent Study in Finance. Prerequisite: consent of instructor. [1–4] Staff.

637. Research Seminar in Finance. Prerequisite: consent of instructor. [1–4] Staff. (Offered on demand).

642. Research Seminar in Organization Studies. Prerequisite: consent of instructor. [1–4]. Staff.

645. Independent Study in Organization Studies. Prerequisite: consent of instructor. [1–4]. Staff.

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. [1–4] Novak.

665. Independent Study in Marketing. Prerequisite: consent of instructor. [1–4] Staff.

672. Research Seminar in Operations. Prerequisite: consent of instructor. [1–4] Staff.

675. Independent Study in Operations Management. Prerequisite: consent of instructor. [1–4].

685. Independent Study in Quantitative Analysis. Prerequisite: consent of instructor. [1–4] Staff.

692. Ph.D. Seminar in Telecommunications and Electronic Commerce (TEC). Presentation and review of research papers in areas in which faculty members have special research interests, with a view to possible dissertation topics for doctoral students. Included may be decision support and expert systems, computer networking, distributed data bases, physical structures and implementation of data base systems, data base integrity and security, modeling of computer systems, formal representation of processes, economics of information systems, specialized computer architecture to support business applications, software engineering models, and modeling of communication and computing systems. Prerequisite: consent of instructor. [2] Basu, Gavish.

695. Independent Study in Telecommunications and Electronic Commerce. Prerequisite: consent of instructor. [1–4] Staff.

Management of Technology

INTERIM DIRECTOR Kazuhiko Kawamura
PROFESSORS EMERITI Robert W. House, Barry D. Lichter, Robert T. Nash
PROFESSORS Mark David Abkowitz, Jimmy L. Davidson, Kazuhiko Kawamura,
    David V. Kerns, Jr., Sherra E. Kerns, Frank L. Parker
RESEARCH PROFESSORS James E. Auer, Eugene E. Pentecost
ASSOCIATE PROFESSOR Gautam Biswas
RESEARCH ASSOCIATE PROFESSORS J. Olin Campbell, Susumu Kurokawa
ADJUNCT ASSOCIATE PROFESSORS John A. Bers, Andrew J. Dozier,
    Ernest G. Freudenthal, Benjamin T. Jordan, Jr.
ADJUNCT INSTRUCTORS James P. Brown, Craig A. Stevens

DEGREE OFFERED: *Master of Science*

❧ THE program emphasizes research and workable approaches to managing the development and application of technologies for both the public and private sectors. The program's interdisciplinary approach prepares students to manage technology development and innovation; enhance manufacturing quality and productivity in a competitive international environment; and implement these objectives in a technology-intensive organization.

The master of science degree requires 24 hours of course work, which includes 18 hours in management of technology courses and a minor of six hours in related disciplines (e.g., management, economics, etc.). All

course programs must be approved by the student's adviser. A research thesis is required. Students interested in earning the Ph.D. degree in management of technology may develop an individualized program of study as described under Special Programs in this catalog.

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

255. Societal Systems: Planning, Policy, and Complexity. Complexity common to and inherent in many societal systems. Methods for restructuring that complexity and for understanding and managing it. Interpretive structural modeling in relation to planning and management, policy making, and systems engineering. Behavioral considerations in applying interpretive structural analysis and other methods for managing the generation and analysis of ideas. [3] (Not currently offered)

257. Seminar. FALL. [Variable credit: 1–3 each semester] Staff. (Not currently offered)

261. Materials Resources Policy Studies. The engineering and technological details affecting availability and use of materials derived principally from non-fuel mineral resources. The concept of criticality and the criteria for identifying critical materials. Rational use of materials and formulations of materials policy, in light of social, economic, and political, as well as technological climates which may exist. [3] (Not currently offered)

262. Energy Resources Policy. Past, present, and future trends of energy resource use, energy demands, and energy technology development, including impacts on social, ecological, and economic domains with discussions of relevant policy formulations. Prerequisite: consent of instructor. [3] (Not currently offered)

265. Environmental Risk Management. (Also listed as CE 275) Development of environmental safety programs for technological operations. Focuses on defining an environmental risk management process and program implementation, performing risk assessments, determining and selecting appropriate risk reduction strategies, and influencing risk management decisions internally and externally. Extensive use of case studies drawn from the chemical and energy-producing industries. SPRING. [3] Abkowitz.

274. Informatics Engineering. (Also listed as EECE 274) The study, invention, and implementation of structures and algorithms to improve communication, understanding, and management of information. Course topics include: learning to access computer-based information resources and managing and building information products. An intensive team-oriented project experience is included. Prerequisite: ES 130, CS 201, ECE 112, or consent of the instructor. SPRING. [3] Bourne.

275. Technology Assessment and Forecasting. Methods of assessing technological changes in the social, political, ecological, economic, legal, and institutional environments. Technology forecasting is treated in detail: intuitive thinking, exploratory techniques of trend extrapolation, normative techniques of relevance and perspective trees, scenario writing, etc. Government and industrial reports are used as case studies and a term project is required. [3] Staff. (Not currently offered)

278. The Technical Basis for Environmental Policy. (Also listed as CE 278 and Economics and Business Administration 278) The engineering and economic foundations of environmental policy formulation, mathematical computer modeling of the environment, and economic valuation of environmental quality. Treatment and site cleanup processes, funda-

mental equations of environmental engineering, the notion of market failure, and economics of monitoring and enforcement. SPRING. [3] Parker, Russell (VIPPS)

280. Introduction to the Management of Manufacturing. An overview of the state of the art of manufacturing technologies and processes. Also provides an overview of robotics, automation, information technologies, and flexible manufacturing systems. Will investigate the various organizational impacts related to the changing manufacturing work environment. FALL. [3]

310. Theory and Practice of Managing Technology. Introduction to concepts of purchasing, manufacturing, marketing, and product development in the engineering intensive firm. Product evolution, continuous improvement in manufacturing processes, quality management, relations with suppliers, and relations with customers are covered. FALL. [3] Staff.

311. Theory and Practice of Managing Technological Change. Significant changes in products, manufacturing processes, inputs, and markets made by engineering intensive firms are studied. Interactions between the manufacturing, engineering, and marketing functions, as well as interactions with users are brought out through case studies. SPRING. [3] Staff.

MT 312. Probabilistic Methods in Engineering Design. (Also listed as CE 310) 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. Emphasis on applications in civil, mechanical, and chemical engineering. Prerequisite: Math 194 or consent of instructor. FALL [3]

321. Technical Project Management. Organizational and human factors involved in the management of technical projects. Systems life-cycle approach used in characterizing project tasks and work flow. Influence of organization's structure, behavior, and processes. Skills needed to develop project team and direct and control project work. Project work definition, scheduling, budgeting, control, and performance evaluation methods. SPRING. [3] Stevens.

322. Quality Management. Fundamentals of quality management and continuous improvement in the technology-based company. Influence of organizational culture on the use of specific methods, and approaches toward achieving quality. Customer value concepts and measurement; management of quality to enhance the customer's value. Prerequisite: 310 or consent of instructor. SUMMER. [3] Staff.

330. Marketing in the Technology Enterprise. Role of marketing in the technology-based company to maximize return on technologies in the marketplace. Translating core technologies into customer technologies in the marketplace. Translating core technologies into customer value, managing the risks of commercialization, and developing and implementing market plans. Prerequisite: 310 or consent of instructor. SPRING. [3] Staff.

MT 359. Emerging Information Systems Applications. (Also listed as CE 359) An introduction to emerging information systems technologies and their role in improving productivity and efficiency in managing engineering operations. Design of integrated approaches to enhance the speed, accuracy, reliability, and quantity of information available for decision support. Emphasis on case studies of innovative applications in transportation and manufacturing, leading to individual and group projects requiring new product development. Prerequisite: background in transportation or manufacturing operations, or consent of instructor. FALL. [3]

369. Master's Thesis Research.

386. New Ventures Based on Technology and Engineering. Identification and evaluation of opportunities. Risks faced by entrepreneurs. Market assessment, capital requirements, and acquisition of venture capital. Legal structures and their tax implications for starting businesses. Prerequisite: 310 or consent of instructor. FALL. [3] Abkowitz, Kerns.

391–392. Special Topics. Special topics of interest to staff and students based on research or current developments in management of technology. FALL. [Variable credit: 1–3 each semester] Staff.

Materials Science and Engineering

DIRECTOR Robert J. Bayuzick
DIRECTOR OF GRADUATE STUDIES Robert J. Bayuzick
PROFESSORS EMERITI George T. Hahn, Barry D. Lichter, James J. Wert
PROFESSORS Robert J. Bayuzick, Jimmy L. Davidson, William F. Flanagan,
    Tomlinson Fort, Donald L. Kinser, Taylor G. Wang
RESEARCH PROFESSOR Robert A. Weeks
ASSOCIATE PROFESSORS Weng Poo Kang, Robert A. Weller, James E. Wittig
RESEARCH ASSOCIATE PROFESSORS A. V. Anilkumar, William H. Hofmeister,
    Chun Ping Lee
ADJUNCT ASSISTANT PROFESSORS Michael A. George, Robert H. Magruder III

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

❧ MATERIALS science and engineering deals with the structure, properties, and performance of materials. This discipline uses advanced analytical and experimental tools to analyze the origins of internal structure and the relations between structure and properties, and to develop the means for converting this knowledge into new materials and processing methods. The program at Vanderbilt University brings together developments in metals and alloys, ceramics, glasses, electronic materials, polymers, and composites with the fundamental elements of the relationship between properties and structure, the thermodynamics of materials, the physics and chemistry of solids, the physics and chemistry of liquids, surface science, and materials characterization.

In addition to facilities of the program, the program draws on the specialized equipment of many research activities. The Center for Microgravity Research and Applications (CMRA) is pursuing nonlinear acoustics, fluid dynamics, containerless processing, undercooling, biotechnology, and directional solidification. In addition to these activities, groups of faculty members are working on electronic and optical properties of glasses, ion-implantation of materials, and electrochemical and corrosion science.

The laboratories house x-ray diffraction facilities, a Hitachi S-4200 cold field emission gun high resolution scanning electron microscope with an energy dispersive x-ray spectrometer, an analytical Philips CM2OT transmission electron microscope, and a Leybold Heraeus x-ray photoelectron spectrometer as well as standard mechanical testing equipment. In addition, electron paramagnetic resonance, optical and IR spectrometers, a vibrating sample magnetometer, and other facilities for determining the electrical, magnetic, and optical properties of materials are available. Corrosion and electrochemistry facilities are computer-interfaced and include a Solartron interface, PAR potentiostats, a Nicolet digital recording oscilloscope, and an ATS slow-strain-rate system.

There are electromagnetic and acoustic levitators, high and low temperature directional solidification furnaces, a high gravity centrifuge, and drop tubes. A computer-controlled, servohydraulic, axial-torsion testing system with high speed data acquisition can produce complex multi-axial stress states. A 300 kV accelerator for ion implantation and fundamental impact studies is installed. The Vanderbilt Free-Electron Laser Center provides a unique environment for study of the interaction of intense, tuneable radiation in the 2–10 micron wavelength range with matter.

The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

250. Materials Science II. Combines a physical chemistry approach with development of concepts of microstructures applied to ceramics, glasses, metals, semiconductors, polymers, and composites. Includes a brief survey of relevant areas of thermodynamics and kinetics; phase equilibria; characterization of phases; diffusion, solidification, and resulting structure and properties; solid-state transformations; synthesis and modern processing techniques. Prerequisite: 150, Materials Science I. FALL. [3] Staff.

251. Mechanical Behavior of Engineering Materials. Deformation modes of materials with a wide range of structural perfection from both the continuum-mechanics and atomic-level approach. The dislocation concept of plastic deformation is introduced and used to explain the relationships between microstructure and mechanical properties. The phenomena of strain hardening, creep, fatigue, and fracture. Prerequisite: 150, Materials Science I. FALL. [3] Staff.

252. Ceramics. The relationship between atomic structure and the processing and applications of ceramic materials. Discussion of classical ceramic bodies, glasses, refractories, cements, and electrical ceramics. FALL. [3] Staff.

253. Corrosion Science and Engineering. Fundamentals of corrosion and corrosion control of metals and alloys. Review of electrochemical principles, ionics, electrodisc, thermodynamics, and kinetics applied to electrode reactions. Description of the major forms of corrosion in engineering materials. Treatment of passivity, cathodic and anodic protection, inhibitors, and coatings. Corrosion failure by pitting, stress corrosion cracking, corrosion fatigue, and hydrogen damage. Emphasis on relation of fundamental modern theory to design, testing, and application. No credit for graduate students in materials science. [3]

256. Surfaces and Thin Films. Introduction to modern surface and thin film modification and analysis. Topics include sputtering, ion implantation, backscattering spectrometry, secondary ion mass spectrometry, electron spectroscopies, surface structure and nuclear

reaction analysis. Applications in semiconductor device fabrication are discussed. Prerequisite: 150, Materials Science I, or consent of instructor. [3] (Offered on demand)

275. Diffraction Methods in Materials Science. Principles and applications of x-ray analysis and transmission and scanning electron microscopy as applied to the study of materials. Stereographic projections, x-ray and electron scattering, crystal structure determination, fluorescent analysis, image contrast theory, and specimen preparation. Two lectures and one laboratory. Prerequisite: 150, Materials Science I. [3]

278. Physics of Solids. Basic concepts and formalism of quantum mechanics; basic crystal structure; lattice vibrations and phonons; quantum statistics of phonons and electrons; free electron theory of metals; elementary band theory of solids; electrical, thermal, magnetic and optical properties of materials; superconductivity. SPRING. [3] Staff.

279. Materials in Nuclear Technology. The role of materials in nuclear reactor technology. A summary of reactor concepts and a consideration of factors in the selection of materials. The physics of radiation damage and changes in properties of materials after irradiation. Specific consideration of the properties, radiation behavior, and fabrication of materials commonly used in the nuclear field. Prerequisite: 150, Materials Science I, or consent of instructor. [3] (Offered on demand)

281. Materials Selection and Design. The principles of materials science and the selection, design, and analysis of materials for engineering structures. Emphasis on the role of microstructure in application, design, and failure analysis. A design project and the analysis of engineering failures. Two lectures and one lab. Prerequisite: 150, Materials Science I, and CE 182, Mechanics of Materials. [3]

282. Fracture-Safe Material Selection and Design. A study of design concepts, analyses, and test methods for assuring fracture-safe structural reliability. Considers the essentials of fracture mechanics, material toughness parameters used in materials specifications, non-destructive inspection methods in design, and use of fracture mechanisms as a basis for interpreting fractographs to determine causes of failure. Case histories and student design projects. Prerequisite: 150, Materials Science I, and CE 182, Mechanics of Materials. [3] Staff.

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. [3] Staff.

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

325. Polymer Science and Engineering. (Also listed as Chemical Engineering 325) Macromolecular systems, with emphasis on the interrelationship of chemical, physical, and engineering properties and the further relation of these properties to synthesis and application. A basic understanding of organic chemistry and of physical chemistry is assumed. [3] Staff.

330. Thermodynamics and Kinetics of Materials. Thermodynamic properties of materials including approximate atomistic models, interfaces, structural defects in metallic and ionic crystals, thermodynamics of electrolytes, and elements of statistical thermodynamics. Introduction to kinetic processes, with illustrations and applications in corrosion and oxidation of metals and alloys. [3] Staff.

340. Transitions in Condensed Systems. Fundamentals of condensation and phase transformations in condensed systems and the genesis of microstructure. Specific aspects of thermodynamics that are the foundation for understanding phase transformations. Reaction rate theory and a treatment of the relevant areas of diffusion. Nucleation and growth theory and its applications to compositional and structural transitions. Review of diffusionless transformations in the solid state. SPRING. [3] Staff.

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] Staff.

344. Fracture. Theoretical and engineering aspects of the fracture process. Includes continuum, fracture concepts, notch theory, statistical analysis of fracture, linear elastic fracture mechanics, and the metallurgical aspects of fracture. Emphasis on predicting the onset of fracture under conditions of brittle behavior, fatigue, stress corrosion, quasi-brittle, and ductile failure processes. Design concepts using linear elastic fracture mechanics will be developed. Prerequisite: consent of instructor. [3] Staff.

345. Structure of Glasses. The application of atomic structure to a study of physical properties of amorphous systems. Glass melting, thermal processing, viscosity, optical properties, electric properties, and other topics. Emphasis on structure-property relationships. Glass systems discussed include silicate, borate, and phosphate, as well as nontraditional glassforming systems. Prerequisite: consent of instructor. SPRING. [3] Kinser.

347a–347b. Theory of Alloys. The fundamentals of atomic structure and electron distribution which govern alloying relationships; solid solutions and intermediate phases in alloy systems. Prerequisite: 340. [3–3] (Offered on demand)

348. Diffraction Methods in Materials Science. Selected topics from the following: Warren-Averbach line-broadening analysis of particle size, microstrain, and stacking faults; diffuse scattering due to thermal vibrations, static displacements, and short-range order; lattice dynamics by Debye-Waller integrated-intensity analysis and neutron scattering; small angle scattering; x-ray topography; and others. Prerequisite: 275. [3] (Offered on demand)

349. Solid-State Diffusion. Fick's laws; Kirkendall effect; mechanisms of diffusion; movement of defects. Particular emphasis on the oxidation of metals and the associated time laws. Prerequisite: 340. [3] Staff.

350. Mechanical Behavior of Materials. The more advanced analyses of the major forms of mechanical behavior of metals, ceramics, and polymers in the form of crystals, glasses, multi-phase mixtures and composites. The elastic behavior of anisotropic crystals and composites and the viscoelastic behavior of polymers. Examination of plastic behavior including important dislocation mechanisms, analyses of cyclic plasticity, creep, and the strength of polymers and composites. The mechanisms of ductile fracture, creep fracture, and fatigue fracture. The fundamentals of fracture mechanics are introduced and used to treat the origins of cleavage fracture, fracture toughness, and the ductile-to-brittle transition.

Throughout, the underlying mechanisms and the relations between microstructure and properties are emphasized. FALL. [3] Staff.

353. Topics in Corrosion and Electrochemistry. An advanced treatment of topics related to corrosion engineering and corrosion science, stressing fundamentals of electrochemistry and their application to corrosion systems: thermodynamics of corrosion systems; the Pourbaix diagram, thermodynamics, and structures of charged interfaces. Charge transfer and electrode kinetics: the Butler-Volmer equation, the Wagner-Traud analysis, the Evans diagram, multistep reactions and the concept of rate determining step, reversibility, and the Nernst equation. Diagnostic determination of reaction mechanisms in corrosion of metals. Treatment of electrodeposition, the hydrogen evolution reaction, corrosion of alloys, stress corrosion cracking. SPRING. [3] Staff.

369. Master's Thesis Research. FALL, SPRING. [0] Staff.

391–392. Special Topics. Based on faculty research projects and highly specialized areas of concentration. FALL, SPRING. [Variable credit: 1–3 each semester] Staff.

397–398. Seminar. A required noncredit course for all graduate students in the department. 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. [0–0] Staff.

399. Ph.D. Dissertation Research.

Mathematics

CHAIR Constantine Tsinakis
DIRECTOR OF GRADUATE STUDIES John G. Ratcliffe
DIRECTOR OF GRADUATE STUDENT TEACHING Matthew Gould
PROFESSORS EMERITI Richard F. Arenstorf, Billy F. Bryant, Richard R. Goldberg,
    Robert L. Hemminger, Bjarni Jónsson, Charles S. Kahane, James R. Wesson,
    Horace E. Williams
PROFESSORS John F. Ahner, Philip S. Crooke III, Matthew Gould, C. Bruce Hughes,
    Ettore F. Infante, Ralph McKenzie, Charles K. Megibben, Michael L. Mihalik,
    Alexander Ol'Shanskii, Michael D. Plummer, Mark V. Sapir, Larry L. Schumaker,
    Constantine Tsinakis, Glenn F. Webb, Daoxing Xia
ASSOCIATE PROFESSORS Akram Aldroubi, Mark N. Ellingham, Douglas P. Hardin,
    Richard J. Larsen, John G. Ratcliffe, Eric Schechter, Steven T. Tschantz
ASSISTANT PROFESSORS Jonathan D. Farley, Mary Ann Horn, Kirill Kopotun,
    Marian Neamtu, Boris Okun, Bojan Popov, Gieri Simonett, Dechao Zheng

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

❧ A MASTER'S degree may be earned by (a) completing 24 hours of course work and a thesis or by (b) completing 36 hours of course work. It may also be awarded (c) on admission to candidacy for the Ph.D. degree.

Program (b) is strongly recommended for students who plan to terminate their graduate work with a master's degree; with the department's approval, however, a student may pursue a terminal master's degree under program (a).

By careful selection of courses, a master's candidate may achieve special preparation in applied mathematics, or computer science and thus become qualified for a position in industry or government or as a teacher in high school or junior college. Each of the master's programs is adequate preparation for advanced graduate work in mathematics.

Candidates for the Ph.D. degree take at least 48 hours of formal course work, including seven courses from 272a–272b, 283a–283b, 330a–330b, and 331a–331b, and at least eight additional courses at the 300 level. All Ph.D. candidates are required to demonstrate a reading knowledge in one of the following languages: French, German, Russian. A complete description of Ph.D. requirements in mathematics may be obtained on request from the director of graduate studies.

Courses acceptable for credit toward an advanced degree in mathematics are those listed below that are numbered 270 or above, unless exception has been granted. Courses numbered below 270 may be used for minor credit by students in other disciplines. All graduate students participate in teaching activities. This requirement may be waived in the case of students with previous teaching experience.

200. Intensive Problem Solving and Exposition. (Formerly 258) Intended to develop widely applicable mathematical skills. Focus on use of basic principles such as induction, the pigeonhole principle, symmetry, parity, and generating functions. Prerequisite: one year of calculus and consent of instructor. [3] (Not currently offered)

204. Linear Algebra. (Formerly 237) Algebra of matrices, real and complex vector spaces, linear transformation, systems of linear equations. Eigenvalues, eigenvectors, Cayley-Hamilton theorem. Inner product spaces, orthogonal bases. Hermitian matrices. Designed primarily for mathematics majors. No credit for students who have completed 194 or 205a. Corequisite: 170b or 175. FALL, SPRING. [3] Staff.

208. Ordinary Differential Equations. (Formerly 247) First- and second-order differential equations, applications, linear differential equations, series solutions, boundary-value problems, existence and uniqueness theorems. This course is intended for mathematics and advanced science majors. Prerequisite: linear algebra, and 221b or 222 or equivalent. Credit is not given for both 229 and 247. FALL, SPRING. [3] Staff.

214. Discrete Structures. (Formerly 212) A broad survey of the mathematical tools necessary for an understanding of computer science. Topics covered include an introduction to sets, relations, functions, basic counting techniques, permutations, combinations, graphs, recurrence relations, simple analysis of algorithms, O-notation, Boolean algebra, propositional calculus, and numeric representation. Prerequisite: One course in computer science or two semesters of calculus. FALL, SPRING. [3] Staff.

215. Discrete Mathematics. (Formerly 213) Elementary combinatorics including permutations and combinations, the principle of inclusion and exclusion, and recurrence relations. Graph theory including Eulerian and Hamiltonian graphs, trees, planarity, coloring, connectivity, network flows, some algorithms and their complexity. Selected topics from computer science and operations research. Prerequisite: linear algebra. FALL. [3] Yu.

218. Introduction to Mathematical Statistics. (Formerly 233) A survey of probability and applied and mathematical statistics. Discrete and continuous probability models, mathematical expectation, laws of large numbers, point estimation, confidence intervals, hypothesis testing, non-parametric techniques, applications. Students taking 218 are strongly urged to take 218L concurrently. Prerequisite: 155b or 170a or consent of instructor. FALL, SPRING. [3] Larsen.

218L. Statistics Laboratory. (Formerly 233L) Applications of the theory developed in 218. Emphasis on data analysis and interpretation. Topics covered include the one- and two-sample problems, paired data, correlation and regression, chi-square, model building. Examples are drawn from many disciplines. Corequisite: 218 or equivalent. FALL, SPRING. [1] Larsen.

219. Introduction to Applied Statistics. (Formerly 234) A brief review of basic applied statistics followed by a development of the analysis of variance as a technique for interpreting experimental data. The generalized likelihood ratio principle, completely randomized designs, nested designs, orthogonal contrasts, multiple comparisons, randomized block designs, Latin squares, factorial designs, 2^n designs, fractional factorials, confounding, introduction to response surface methodology. Applications will be emphasized. Prerequisite: 218 or equivalent. SPRING. [3] Larsen.

221. Theory of Numbers. (Formerly 235) The Euclidean algorithm, Euler's phi function, simple continued fractions, congruences, Fermat's theorem, Wilson's theorem, and elementary Diophantine equations. FALL, SPRING. [3] Megibbon, Ratcliffe.

223. Abstract Algebra. (Formerly 231) Fundamental properties of integers and polynomials. Elementary properties of groups, rings, integral domains, and fields. FALL, SPRING. [3] Staff.

226. Introduction to Numerical Mathematics. (Formerly 248; also listed as Computer Science 255) Numerical solution of linear and nonlinear equations, interpolation and polynomial approximation, numerical differentiation and integration, least-squares curve fitting and approximation theory, numerical solution of differential equations, errors and floating point arithmetic. Application of the theory to problems in science, engineering, and economics. Student use of the computer is emphasized. Prerequisite: Computer programming and linear algebra. FALL, SPRING. [3] Staff.

229. Advanced Engineering Mathematics. (Formerly 246) 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. FALL. [3] Staff.

234. Methods for Initial and Boundary-Value Problems. (Formerly 245) Construction of the solutions to initial- and boundary-value problems for partial differential equations using separation of variables in conjunction with Fourier series and integrals. Emphasis on obtaining explicit formulas for the solutions of various problems involving the heat equation, the wave equation, and Laplace's equation. Prerequisite: elementary differential equations. Recommended: linear algebra. FALL, SPRING. [3] Staff.

240. Transformation Geometry. (Formerly 271) 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 pat-

terns. Especially recommended for prospective teachers of mathematics. Prerequisite: linear algebra. FALL. [3] Ratcliffe.

242. Topology of Surfaces. (Formerly 240) Fundamental concepts of topology, including properties of continuity, compactness, and connectivity. Topology of surfaces, triangulations, and the fundamental group. Introduction to basic ideas of graph theory, vector fields, and Euclidean and hyperbolic geometry. FALL. [3] Hughes.

247. Probability. (Formerly 254) 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: a firm background in intermediate calculus including partial derivatives and multiple integrals. Except for students with extremely strong backgrounds, 218 should be taken prior to 247. FALL. [3] Bronstein.

248. Mathematical Statistics. (Formerly 255) Distribution theory, order statistics, theory of point estimation and hypothesis testing, normal univariate inference, Bayesian methods, sequential procedures, regression, non-parametric methods. Students interested in applications may take 218L. Prerequisite: 247. SPRING. [3] Staff.

250. Introduction to Mathematical Logic. Development of the first order predicate calculus and fundamental metamathematical notions. FALL, SPRING. [3] Schechter.

251. Analytic Number Theory. Arithmetical functions, distribution of prime numbers, Dirichlet's theorem on primes in arithmetic progressions, Dirichlet series, and Euler products. Prerequisite: 221. SPRING. [3] Ratcliffe.

252. History of Mathematics. (Formerly 260) The major developments of mathematics from ancient times to the early part of this century. Emphasis both on historical perspective and on the mathematics; assignments include many exercises and theorems. Prerequisite: completion of 170b or 175 or their equivalent and some algebra (preferably both linear algebra and abstract algebra). Especially recommended for teacher candidates. FALL. [3] Bryant.

253. Error-correcting Codes. (Formerly 232) The algebraic theory of error-correcting codes for information transmission. Block codes, the binary symmetric channel, length, rate and distance. Linear codes, bounds, syndrome decoding, perfect codes, Reed-Muller codes. Cyclic, BCH, and Reed-Solomon codes. Prerequisite: linear algebra. SPRING. [3] Ellingham.

259a–259b. Advanced Calculus. (Formerly 261a–261b) Calculus of functions of several variables, differentiability, implicit functions, extrema, line integrals, surface integrals, theorems of Green, Gauss, Stokes; topology of the line, uniform continuity, theory of integration, infinite series, uniform convergence, power series, improper integrals. 261a, FALL; 261b, SPRING. [3–3] Ahner.

261. Complex Variables. (Formerly 259) Study of complex numbers, analytic and elementary functions, transformations of regions, properties of power series, including Taylor's and Laurent's. The calculus of residues with applications, conformal mapping with emphasis upon boundary value applications. Prerequisite: 198 or 208. SPRING. [3] Mayer.

270. Differential Geometry. (Formerly 268) Curvature, torsion, vector fields, and the Frenet formulas for curves in R3. Review of continuity and differentiation in Rn, Stokes' theorem and applications, fundamental forms and the shape operator, geodesics, and Gaussian curvature for surfaces in R3. The Euler characteristic and the Gauss-Bonnet theorem. Prerequisite: 259a (or equivalent). SPRING. [3] Hughes.

272a–272b. Topology. (Formerly 276a**–**276b) 272a: Connectedness, compactness, countability, and separation axioms. Complete metric spaces. Function spaces. 272b: The fundamental group and covering spaces. Topology of surfaces. Simplicial complexes and homology theory. Homotopy theory. Prerequisite: 242. [3–3] Mihalik.

274. Introduction to Combinatorics. (Formerly 280) Elements of enumerative analysis including permutations, combinations, generating functions, recurrence relations, the principle of inclusion and exclusion, and Polya's theorem. Some special topics will be treated as class interest and background indicate (e.g., Galois fields, theory of codes, and block designs). SPRING. [3] Plummer.

275. Graph Theory. (Formerly 273) An introduction to basic concepts and theorems in graph theory with applications. Path problems, matching theorems, planar graphs and Kuratowski's theorem. Ramsey's theorem, directed graphs, network flow, and the four-color problem. Prerequisite: linear algebra. FALL. [3] Ellingham.

280. Set Theory. (Formerly 269) The basic operations on sets. Cardinal and ordinal numbers. The axiom of choice. Zorn's lemma, and the well-ordering principle. Introduction to the topology of metric spaces, including the concepts of continuity, compactness, connectivity, completeness, and separability. Product spaces. Applications to Euclidean spaces. Strongly recommended for beginning graduate students and for undergraduates who plan to do graduate work in mathematics. Prerequisite: intermediate calculus and linear algebra. SPRING. [3] Staff.

283a–283b. Modern Algebra. (Formerly 281a–281b) 283a: group theory through Sylow theorems and fundamental theorem of finitely generated abelian groups. 2831b: introductory theory of commutative rings and fields, and additional topics such as Galois theory, modules over a principle ideal domain and finite dimensional algebras. Prerequisite: linear algebra. An elementary course in modern algebra (e.g., 231) is strongly recommended.283a, FALL; 283, SPRING. [3–3] Tsinakis.

284. Lattice Theory and the Theory of Ordered Sets. 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, posets, free lattices. Prerequisites: 223 or equivalent. FALL. [3] Farley.

286. Numerical Analysis. (Formerly 270) 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. SPRING. [3] Hogan.

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. Prerequisites: Multivariable calculus, linear algebra, and computer programming. SPRING. [3] Ellingham.

288. Linear Optimization. (Also listed as Computer Science 257) 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. Prerequisites: linear algebra and computer programming. FALL. [3] Ellingham.

290. Introductory Analysis. (Formerly 265) Sets, functions, sequences and series of real numbers, limits, continuous functions, foundations of calculus, sequences and series of real-valued functions. Designed for students interested in a rigorous approach. Prerequisite: elementary calculus. FALL. [4] Staff.

292a–292b. Methods of Mathematical Physics. (Formerly 262a–262b) Hermitian forms, unitary transformations, group representations. Vector analysis, elements of differential geometry. Functions of a complex variable, calculus of residues, asymptotic expansions. Ordinary and partial differential equations of mathematical physics, boundary value problems, eigenfunction expansions. Integral equations, Hilbert space methods. Special functions, asymptotic properties. Integral transforms, generalized functions. Prerequisite: ordinary differential equations and linear algebra. 262a, FALL; 262b, SPRING. [4–4] Ahner.

294. Partial Differential Equations. (Formerly 263) Classification of equations: equations of elliptic, parabolic, and hyperbolic type. Separation of variables, orthonormal series, solutions of homogeneous and nonhomogeneous boundary value problems in one-, two-, and three-dimensional space. Possible additional topics include subharmonic functions and the Perron existence theorem for the Laplace equation of Sturm-Liouville theory. Prerequisite: 198 or 208. FALL. [3] Ahner.

297. Selected Topics. (Formerly 294) Topics of special interest at a level suitable for both senior undergraduate mathematics majors and graduate students in mathematics, as announced in the Schedule of Courses. FALL, SPRING. [Variable credit 1–3, total of all 267 and 297; hours not to exceed 12]

298. Independent Study. Reading and independent study at a level considered introductory to graduate students or in an area of study not currently offered in 270-299 level range. FALL, SPRING. [Variable credit: 1–3]

312. Algebraic Topology. (Formerly 376) Homology, cohomology, homotopy theory. Prerequisite: 272a–272b. FALL. [3] Hughes.

323. Universal Algebra. (Formerly 381) Theory of general algebraic systems. Concepts discussed will include subalgebras, congruences, automorphism groups, direct and subdirect products, ultraproducts, free algebras, varieties and quasi-varieties, with applications to groups, rings fields, lattices, Boolean algebras, semilattices, and semi-groups. Connections with model theory and category theory will be included as time permits. Prerequisite: 283a. Corequisite: 283b. FALL. [3] Staff.

330a–330b. Theory of Functions of a Real Variable. (Formerly 315a–315b) The real number system, transfinite numbers, spaces, point sets in metric spaces, sequences and series of functions, measure. Lebesgue integration, convergence theory, inversion of derivatives. [3–3] Staff.

331a–331b. Theory of Functions of a Complex Variable. (Formerly 317a–317b) Complex integration, calculus of residues, harmonic functions, entire and meromorphic functions, conformal mapping, normal families, analytic continuation, Riemann surfaces, analytic functions of several complex variables. [3–3] Staff.

333. Theory of Ordinary Differential Equations. (Formerly 309) 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] (Not currently offered)

334. Theory of Partial Differential Equations. (Formerly 311) 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] Staff.

362a–362b. Functional Analysis. (Formerly 327a–327b) Function spaces, topological vector spaces, linear operators, conjugate spaces, Hilbert and Banach spaces, Banach algebras. Applications to function theory, differential equations, and integral equations. [3–3] Staff. (Not currently offered)

364a–364b. Nonlinear Differential Equations and Analytical Dynamics. (Formerly 313a–313b) 364a: classical dynamical systems. Lagrangian derivatives, canonical transformations, differential equations on the torus. Existence and continuation theorems, local and global questions. Equilibrium and periodic solutions, local integrals. Poincaré continuation method, characteristic exponents, stability, Liapunov theory. Integrable and Hamiltonian systems, perturbation theory, methods from functional analysis. 364b: surfaces of section, volume-preserving mappings, reduction to normal forms, fixed-point theorems, existence of integrals and convergence problems, Arnold-Moser theory on quasi-periodic motion and invariant tori. Abstract dynamical systems, ergodic properties, almost periodic motions, structural stability. Examples from celestial mechanics and other fields. [3–3] (Not currently offered)

367. Selected Advanced Topics. Topics of special interest at a level suitable for graduate students in mathematics, as announced in the Schedule of Courses. FALL, SPRING. [Variable credit: 1–3]

368. Advanced Independent Study. Reading and independent study in an advanced area of mathematics under the supervision of an adviser. Requires approval of Director of Graduate Studies. FALL, SPRING. [Variable credit: 1–3]

369. Master's Thesis Research.

372a–372B. Seminar in Topology. (Formerly 378–379) Recent topics. (Depending on variation of topics, this course may be repeated). [Variable credit: 1–3 each semester] (Not currently offered)

375a–375b Seminar in Graph Theory. (Formerly 373–374) [Variable credit: 1–3 each semester] Staff.

381a–381b. Seminar in Number Theory. (Formerly 390–391) Recent topics. Depending on variation of topics, this course may be repeated. [Variable credit: 1–3 each semester] (Not currently offered)

383a–383b. Seminar in Algebra. Recent topics. (Formerly 388–389) (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester] Staff.

386a–386b. Seminar in Computational Mathematics. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1-3 each semester] Staff.

390a–390b. Seminar in Analysis. (Formerly 366–367) Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester] Staff.

394a–394b. Seminar in Applied Analysis. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester] Staff.

395a–395b. Seminar in Mathematical Biology. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester] Staff.

398. Directed Study. (Formerly 350) A reading course designed to give graduate students more background. FALL, SPRING. [Variable credit: 1–3 each semester] Staff.

399. Ph.D. Dissertation Research.

Mechanical Engineering

CHAIR Robert W. Pitz

DIRECTOR OF GRADUATE STUDIES Arthur M. Mellor

PROFESSORS EMERITI Thomas A. Cruse, John H. Dunlap, William F. Flanagan, George T. Hahn, Barry D. Lichter, James J. Wert, John W. Williamson

PROFESSORS Donald L. Kinser, Arthur M. Mellor, Robert W. Pitz, Carol A. Rubin, Alvin M. Strauss, Taylor G. Wang

RESEARCH PROFESSORS EMERITI J. Leith Potter, Robert A. Weeks

ADJUNCT PROFESSORS Michael Busby, Jiann-Shiunn Lew, Sivapragasam Sathananthan

ASSOCIATE PROFESSORS Ephrahim Garcia, Paul H. King, Robert L. Lott, Jr.

RESEARCH ASSOCIATE PROFESSORS Amrutur V. Anilkumar, Dale W. Evertson, Joseph A. Wehrmeyer

ADJUNCT ASSOCIATE PROFESSOR Lee-Hyun Keel

ASSISTANT PROFESSORS Timothy S. Fisher, Kenneth D. Frampton, Michael Goldfarb

ADJUNCT ASSISTANT PROFESSORS Robert H. Magruder, III, Yong Xin Tao

RESEARCH PROFESSOR Kenneth E. Harwell

RESEARCH ASSISTANT PROFESSOR John M. Dawson

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 present a minor of at least 6 hours in one or more separate areas of study related to the major. The Ph.D. program includes two minors, one of at least 12 hours in a separate but related area and a second of 6 to 9 hours in a field other than mechanical engineering or mathematics. The selection of courses and total number of hours required are determined individually. The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

256. Advanced Strength of Materials. Mathematical basis for analysis of stress and strain appropriate to design of mechanical elements and systems. Topics include: inelastic behavior, durability, thermoelastic behavior, thin walled elements, composite materials and stability. Prerequisite: 201, Design of Machine Elements, CE 182, Math 198. [3] (Offered on demand)

257. Engineering Systems Analysis. A study of dynamic systems and controls, including operational techniques, root locus method. Nyquist method, state variable representation to describe mechanical, hydraulic, thermal, and electrical systems; analysis and synthesis. Credit is given for only one of ME 257 and EECE 257. Prerequisite: 190; Math 198; EECE 112. [3] (Offered on demand)

259. Engineering Vibrations. Theory of vibrating systems and application to problems related to mechanical design. Topics include single degree of freedom systems subject to free, forced, and transient vibrations; systems with several degrees of freedom, methods of vibration suppression and isolation, and critical speed phenomena. Prerequisite: 190, Math 198. FALL [3]

260. Energy Conversion I. Energy resources, use, and conservation are studied. The fundamentals of positive displacement machinery, turbo-machinery, and reactive mixture are introduced and used to examine various forms of power-producing systems. Prerequisite: 220b, 224. FALL. [3]

261. Basic Airplane Aerodynamics. Includes aerodynamic forces, airfoil characteristics from both theory and experiment, aircraft experiment, aircraft performance, longitudinal and lateral stability and control. Prerequisite: 224. FALL. [3]

262. Environmental Control. A study of heating and cooling systems, energy conservation techniques, use of solar energy and heat pumps. Prerequisite: 220b; corequisite: 248. SPRING. [3]

264. Internal-Combustion Engines. A study of the thermodynamics of spark ignition and compression ignition engines; gas turbines and jet propulsion. Prerequisite: 220b. SPRING [3]

265. Direct Energy Conversion. The principles and devices involved in converting other forms of energy to electrical energy. Conversion devices: electro-mechanical, thermoelectric, thermionic, fluid dynamic, and fuel cell. Students who have earned credit for EECE 269 may not receive credit for ME 265. Prerequisite: 220a, Thermodynamics I. [3] (Offered 2000/2001 and alternate years).

270. Advanced Mechanism Design. Concepts of the underlying geometry of constrained motion, both infinitesimal and finite, as used in the design of the motions of machine elements. Topics include kinematic invariants, centrode geometry, the Euler-Savary equation, the cubic of stationary curvature, pole triangles and quadrilaterals, Burmester theory, and the theory of screws. Prerequisite: 200. [3] (Offered on demand)

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: 190, Dynamics, and Math 194. FALL. [3]

275. Introduction to Finite Element Analysis. Development and solution of finite element equations for solid mechanics and heat transfer problems. Introduction to commercial finite element and pre- and post-processing software. Two lectures and one three-hour laboratory each week. Prerequisite: CE 182, Math 198. SPRING. [3]

280. Advanced Dynamics of Mechanical Systems. Development of methods for formulating differential equations to model mechanical systems, including formalisms of Newton-Euler, Lagrange, and virtual work methods to two- and three-dimensional systems. Prerequisite 190 and Math 198. [3] (Offered 2000/2001 and alternate years)

284. Modeling and Simulation of Dynamic Systems. Incorporates bond graph techniques for energy-based lumped-parameter systems. Includes modeling of electrical, mechanical, hydraulic, magnetic and thermal energy domains. Emphasis on multi-domain interaction. Prerequisite: 234, Systems Dynamics. FALL. [3]

313. 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. [3] (Offered on demand)

315. Advanced Instrumentation. Analysis of measurement system with attention to errors. Reconstruction of measured data from output information, accounting for distortion, the length of record, and the type of data, whether continuous, discrete, or sampled. FALL. [3] (Offered 2000/2001 and alternate years)

325a. Advanced Fluid Dynamics I. A study of the kinetics of inviscid and viscous fluids. Use of the constitutive equations for study of steady or transient, and laminar or turbulent flows. Application to numerous engineering problems. Prerequisite: 224 or equivalent. FALL. [3]

325b. Advanced Fluid Dynamics II. A continuation of 325a: the phenomenological theories of turbulence are applied to boundary layer flow. The fundamentals of turbulence, including correlation functions and spectra are examined, and existing methods of measurement are discussed. Prerequisite: 325a or consent of instructor. SPRING. [3]

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: 224. SPRING. [3] (Offered 1999/2000 and alternate years)

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]

328. Propulsion Systems. A study of turbojet, ramjet, rocket motor, and advanced propulsion systems. The influence of component performance upon the overall system is emphasized. Preliminary designs of propulsion systems and criteria of performance are developed. Prerequisite: Consent of instructor. [3] (Offered on demand)

331. Robot Manipulators. (Also listed as Electrical and Computer Engineering 331) Dynamics and control of robot manipulators. Includes material on Jacobian matrix relating velocities and static forces, linear and angular acceleration relationships, manipulator dynamics, manipulator mechanism design, linear and nonlinear control, and force control manipulators. Prerequisite: 271, Introduction to Robotics. SPRING. [3]

334. Principles of Nuclear Engineering. For graduate students without a previous background in nuclear engineering. Nuclear reactions and radiation, the fission process, diffusion and moderation of neutrons, reactor theory, control, materials, shielding, economics, and design. FALL. [3] Staff.

350. 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: 257, Math 194. FALL. [3] (Offered 2000/2001 and alternate years)

353. Design of Electromechanical Systems. Analog electronic design for purposes of controlling electromechanical systems, including electromechanical sensors and actuators, analog electronic design of filters, state space and classical controllers, and transistor-based servoamplifiers and high voltage amplifiers. The course has a significant laboratory component in which students are expected to design and fabricate circuits to control electromechanical systems. Implementation of digital controllers is also covered. Prerequisite: ME234, ME257, and EECE112. FALL [3] Goldfarb. (Offered alternate years).

355. Engineering Design and Optimization. Methods for optimal design of mechanical systems are developed and applied. Nonlinear optimization strategies are implemented through progressive exercises on unconstrained and constrained optimization problems with single and multiple design variables. Students explore the implementation of basic algorithms through computer-based tools and available Fortran (or C) subroutines. Feasibility and optimality conditions and design problem formulation are emphasized. Computer literacy and some programming experience are required. Each student is expected to complete a major design project in their area of technical interest. [3] (Offered on demand)

356. Mechanical System Reliability. Methods for optimal design of mechanical systems are developed and applied. Nonlinear optimization strategies are implemented through progressive exercises on unconstrained and constrained optimization problems with single and multiple design variables. Students explore the implementation of basic algorithms through computer-based tools and available Fortran (or C) subroutines. Feasibility and optimality conditions and design problem formulation are emphasized. Computer literacy and some programming experience are required. Each student is expected to complete a major design project in their area of technical interest. [3] (Offered on demand)

359. Advanced Engineering Vibrations. The development and application of Lagrange's equations to the theory of vibrations. Nonlinear systems and variable spring characteristics are analyzed by classical methods and by digital computer techniques. Applications to the design of high speed machines are emphasized. Prerequisite: 259; Math 234, 246. [3] (Offered 2000/2001)

360. Statistical Thermodynamics. Old and modern quantum theory, including H atom, rigid rotor, and harmonic oscillator. Atomic and molecular structure and spectra. Maxwell-Boltzmann statistical model for ideal, chemically reacting, electron, or photon gas. Introduction to Gibbs method. Prerequisite: 220b. FALL. [3] (Offered 2000/2001 and alternate years)

362. Selected Topics in Thermodynamics. This course includes such topics as non-equilibrium thermodynamics, relaxation phenomena, and linear passive systems. Prerequisite: 220b. [3] (Offered on demand)

363. Conduction and Radiation Heat Transfer. A comparative study of available methods for solution of single and multidimensional conduction heat transfer problems. Both steady and transient problems are considered. Mathematical and numerical methods are stressed. Radiant exchange between surfaces separated by non-participating media is studied. Numerical methods are developed and discussed for non-isothermal surfaces and combined radiation and conduction problems are solved. Prerequisite: 248. SPRING. [3] (Offered 1999/2000 and alternate years)

364. Convection Heat Transfer. A wide range of topics in free and forced convection is discussed. Solutions are carried out using analytical, integral, and numerical methods. Internal and external flows are considered for both laminar and turbulent flow cases. Convection in high speed flow is also studied. Prerequisite: 248, 325a. SPRING. [3] (Offered 2000/2001 and alternate years)

365. Special Topics in Heat Transfer. Topics such as boiling, condensation, ablation and heat transfer in MHD flows, rarefied gases, and two-phase flows are studied. Prerequisite: 363, 364. [3] (Offered FALL 1999/2000)

366. Combustion. Introduction to combustion processes. Topics include combustion thermodynamics, chemical kinetics, premixed flame theory, diffusion flame theory, ignition and detonation. Prerequisite: 220b, 224. SPRING. [3] (Offered 2000/2001 and alternate years)

369. Master's Thesis Research.

389. Master of Engineering Project.

391–392. Special Topics. A course based on faculty research projects and highly specialized areas of concentration. [Variable credit: 1-3 each semester]

397–398. Seminar. [0–0]

399. Ph.D. Dissertation Research.

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

Medical Physics

PROGRAM DIRECTOR Charles W. Coffey
DIRECTOR OF GRADUATE STUDIES Royal Albridge
PROFESSORS David J. Ernst, James A. Patton, Ronald R. Price, John P. Wikswo, Jr.
RESEARCH PROFESSOR A. Bertrand Brill
ASSOCIATE PROFESSORS Charles W. Coffey, Michael L. Freeman, Robert L. Galloway,
    David R. Pickens
ASSISTANT PROFESSORS Dennis M. Duggan, Cynthia B. Paschal

DEGREE OFFERED: *Master of Science*

❧ MEDICAL physics is an applied branch of physics devoted to the application of concepts and methods in physics to the diagnosis and treatment of human disease. Research in medical physics typically involves the development of new instrumentation and technology, as well as the development of new medical diagnostic and therapeutic procedures and tests using existing technologies.

Entering students are expected to have acquired basic knowledge in mathematics through partial differential equations, physics (modern, atomic and nuclear, quantum mechanics), electronics, biology, and statistics. Students specialize in either diagnostic medical physics or therapeutic medical physics. For either, the student may follow a non-thesis option (a minimum of 32 hours of course work) or a thesis option (a minimum of 26 hours of course work plus an acceptable thesis).

The program is designed to meet the requirements specified by both the American Board of Radiology and the American Board of Medical Physics.

226a–226b. Intermediate Medical Physics. Applications of physics to human biology and medical instrumentation, including bio-mechanics, statistical mechanics, bioelectricity, bio-magnetism, signal analysis, image processing, atoms and light, x-rays, nuclear medicine, and magnetic resonance imaging. Prerequisite: one year of calculus. Course in biology recommended. [3–3] Wikswo and Price.

243. Health Physics. Theory and instrumentation used in health physics and radiological physics. Radiation shielding design, methods of external and internal dosimetry and radiation regulatory issues. Prerequisite: 153 and one year of calculus. [3]

248. Radiation Biophysics. Response of mammalian cells and systems to ionizing radiation, the acute radiation syndromes, carcinogenesis, genetic effects, and radiobiological basis of radiotherapy. Prerequisite: Biology 110a and 226a. [2] Freeman.

301a. Medical Physics Seminar. Radiotherapy treatment techniques and current methodologies in clinical therapy physics. Prerequisite: 226a. [1] Staff.

301b. Medical Physics Seminar. Topics in medical imaging, techniques and applications. Prerequisite: 226a. [1] Staff.

304. Radiation Interactions and Dosimetry. Theory and instrumentation of ionization measurements of high-energy photon and electron beams. Methods of radiation absorbed dose calculations for photons, neutrons, and charged particles in matter. Prerequisite: 226a, 243 and differential equations. [3]

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 special techniques of brachytherapy and stereoradiosurgery. Prerequisite: 226a and 304. [3] Coffey, Duggan.

312. Clinical Therapy Physics II. Photon and electron beam algorithms for dosimetry calculations. Methodologies in 3-dimensional treatment planning with specific applications to radiotherapy. Prerequisite: 311 and differential equations. [2] Duggan.

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: 226a, 226b, and 304. [3] Patton, Pickens.

314. Laboratory in Clinical Therapy Physics. Laboratory in 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: 226a and 311. [2] Coffey, Duggan.

315. Laboratory in Clinical Diagnostic Physics. Laboratory in the application of principles, techniques, and equipment used in radiographic and fluoroscopic x-ray, CT, MRI, nuclear medicine, and ultrasound imaging. Prerequisite: 226a, 226b, and 313. [2] Price, Patton.

391a. Medical Physics Practicum (Therapy). Experience and training in a radiotherapy physics clinical setting. Treatment planning, instrumentation calibration, quality assurance. Also includes radiotherapy patient interaction, clinical conference attendance, and review of treatment techniques in Radiation Oncology. Prerequisite: 304, 311, 312, and 314. [6] Staff.

391b. Medical Physics Practicum (Diagnostic). Experience and training in a diagnostic physics clinical setting. Instrumentation methodology, calibration, quality assurance. Also includes diagnostic radiology patient interaction, clinical conference attendance, and review of imaging techniques in Radiology. Prerequisite: 304, 313, and 315. [6] Staff.

Microbiology and Immunology

CHAIR Jacek Hawiger
DIRECTOR OF GRADUATE STUDIES G. Neil Green
PROFESSORS EMERITI John H. Hash, David T. Karzon
PROFESSORS Dean W. Ballard, Martin J. Blaser, Jacek Hawiger, J. Harold Helderman,
    Alexander R. Lawton, Geraldine G. Miller, Theodore Pincus, Donald H. Rubin,
    H. Earl Ruley, Subramaniam Sriram, James P. Tam
ASSOCIATE PROFESSORS Mark R. Boothby, G. Neil Green, James Ward Thomas II,
    Peter F. Wright
ASSISTANT PROFESSORS Christopher R. Aiken, Timothy Cover, James Crowe,
    Mark R. Denison, Terence S. Dermody, Hong Fang, Barney S. Graham,
    David W. Haas, Lawrence D. Kerr, Wasif Khan, Yao-Zhong Lin, Eugene M. Oltz,
    Louise A. Rollins-Smith, Paul W. Spearman, Derya Unutmaz, Luc Van Kaer
RESEARCH ASSISTANT PROFESSOR Sheila Downs Timmons

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

❧STUDENTS interested in microbiology and immunology participate in
the Interdisciplinary Graduate Program in the Biomedical Sciences dur-
ing their first year (see Biomedical Sciences). The second year of study
comprises required and elective courses in Microbiology and Immunol-
ogy 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 immunol-
ogy, molecular genetics and pathogenesis, and biotechnology, encom-
passing nucleic acid, protein, and peptide chemistry. Research experience
in a specific area provides the basis for a dissertation. Entering students
normally serve brief apprenticeships in the laboratories of several 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; devel-
  opmental immunology and cell-mediated immunity in parasitic
  and viral infections *(Ballard, Boothby, Crowe, Graham, Hawiger, Kerr,
  Khan, Lawton, Oltz, Rollins-Smith, Thomas, Unutmaz, Van Kaer);*
- Molecular biology of viruses, including DNA- and RNA-containing
  tumor viruses *(Aiken, Denison, Dermody, Graham, Rubin, Ruley,
  Spearman);*
- Vascular biology of growth factors coded by viruses and oncogenes
  (Lin);
- Molecular cell biology of adhesion molecules *(Hawiger, Timmons)*;
- Molecular biology of surface proteins of Campylobacter and Heli-
  cobacter, microbial enzymes, mechanisms of action of toxins and
  antibiotics *(Blaser, Cover);*
- Molecular genetics *(Fang, Green, Ruley);*
- Biomolecular modeling of synthetic vaccines and drugs *(Tam).*

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 or taxonomic aspects of microbiology are not encouraged to apply.

Doctoral study is emphasized. In some cases, students may elect to proceed only to the thesis-only M.S. degree upon the approval of the Graduate Education Committee in the Department of Microbiology and Immunology.

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. Admission to course, hours, and credit by arrangement. FALL, SPRING. [2–4] Staff.

328. Microbes and Immunity. A lecture series on selected topics. The course may be taken once in each of the following subject areas for a maximum total credit of 8 hours.

328 1. Microbial Genetics. (Also listed as Molecular Biology 328) The genetics of bacteria and yeast and their use in molecular biology as an experimental tool. Prerequisite: IGP 300a. FALL. [2] Graham (Molecular Biology), Fang.

328 2. Molecular Virology. The interaction of animal viruses with their host cells, discussed at the molecular and cellular level as model systems. Special emphasis on current literature and methodology. Prerequisite: A course in biochemistry. FALL. [3] Aiken, Dermody, Staff.

328 3. Molecular and Cellular Immunology. The cellular and molecular foundations of the immune response system and the humoral and cellular reactions that result from immunologic interactions. Two lectures per week and seminars presented by students. Prerequisite: Core Curriculum 300a, 300b, and 301, or equivalent. FALL. [3] Oltz and Staff.

328 4. Focal Topics in Microbiology and Immunology. The main objective of this course is to guide students through "real life" cases illustrating dynamic features (entry, colonization, spread, injury, immune response) of the pathogen-host relationship. Small discussion groups led by a faculty preceptor will focus on twelve topics contained in booklets designed for self-directed study. The element of critical thinking in analysis of questions, concepts, and required literature will be introduced. Moreover, graduate students will gain "clinical perspective" to the molecular pathogenesis of microbial and immune diseases important for future research proposals and grant applications. Prerequisite: core curriculum 300A, 300B, 301, or equivalent. SPRING [2] Boothby, Staff.

329. Structural Immunology. The goal of this course is to utilize protein structural information to understand the immunological responses and aid in the design of vaccines and therapeutic agents. Strong emphasis on protein structures and their correlations to functions. SPRING. [2] Tam and Staff.

332. Foundations in Microbiology and Immunology I. The objectives of this course are to alert students to important original research articles in microbiology and immunology, 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. [3] Green and Staff.

333. Foundations in Microbiology and Immunology II. Second semester of required course work. Prerequisite: 332. FALL. [3] Green and Staff.

342. Cancer Biology. (Also listed as Cell Biology 342 and Cellular and Molecular Pathology 342) A multidisciplinary course that emphasizes concepts of basic carcinogenesis and molecular mechanisms. Employs pathologic specimens and patient presentations to illustrate the application of science to the study of human disease. SPRING. [4] Matrisian, Jensen (Pathology), Ruley (Microbiology and Immunology).

350. Pathogen-Host Cellular Microbiology (Also listed as Cell Biology 350). An interdisciplinary course designed to train students of molecular biology and/or cell biology. Model organisms or their products will be analyzed in the context of molecular cell biology. Students will be challenged to utilize new information from microbial genome sequencing to understand host cell subcellular compartments and signaling pathways. Prerequisite: core curriculum 300a, 300b, and MM&IM 322/333 or cell biology equivalent. SPRING. [4] Hawiger, Richmond (Cell Biology), and Staff.

369. Master's Thesis Research.

399. Ph.D. Dissertation Research.

Molecular Biology

CHAIR James V. Staros
DIRECTOR OF GRADUATE STUDIES Charles K. Singleton
PROFESSOR EMERITUS Oscar Touster
PROFESSORS Douglas R. Cavener, Ellen Fanning, Sidney Fleischer,
    Wallace M. LeStourgeon, Gisela Mosig, James V. Staros, Gerald J. Stubbs,
    Robley C. Williams, Jr.
ASSOCIATE PROFESSORS , Thomas N. Oeltmann, James G. Patton, Charles K. Singleton,
    John H. Venable
RESEARCH ASSOCIATE PROFESSOR J. Oliver McIntyre
ASSISTANT PROFESSORS Bruce H. Appel, Todd R. Graham, Andrzej M. Krezel, Lilianna
    Solnica-Krezel, Lawrence J. Zwiebel
RESEARCH ASSISTANT PROFESSOR Cheryl Ann Guyer
SENIOR LECTURER Mark A. Woelfle

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

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

Research work in molecular biology focuses on fundamental biological problems at the cellular, subcellular, and molecular levels. A recurrent theme of research projects is investigation of the molecular mechanisms of biological processes, including evolutionary and developmental aspects of transcriptional and translational control of gene expression; assembly and structure of viruses, organelles, membrane ion channels and receptors, ribonucleosomes, and microtubules; regulation of recombination, replication, and RNA processing; and intracellular and extracellular signalling in coordinating the development of an organism.

The offices, classrooms, and laboratories are located in a building complex adjacent to the Medical School, the Computer Center, and the departments of chemistry, physics, and mathematics, allowing extensive interaction in research and educational activities, and are well equipped with major instrumentation required for biochemical and biophysical investigation, including a complete electron microscopy laboratory, a modern tissue culture facility, and an x-ray diffraction laboratory.

The program is designed to lead to the Ph.D. degree; however, M.S. degrees are granted in special instances. A research thesis is required for the master's degree. Course work required for the Ph.D. degree includes 12 to 15 hours of core courses during the first year through the interdisciplinary Graduate Program in the Biomedical Sciences. Additionally, 4 hours are required in each of the following courses: 390, a research course; 320, a seminar; and three 300-level molecular biology course of 2 or more credit hours. No foreign language is required.

An undergraduate program emphasizing biological sciences, chemistry, or physics is the most desirable background for graduate work in molecular biology, but students from other disciplines are eligible.

201. Introduction to Cell Biology. (Also listed as Biology 201) Structure and function of cells, subcellular organelles, and macromolecules. Fundamentals of organelle function, membrane transport, energy production and utilization, cell motility, cell division, intracellular transport, and mechanisms of signal transduction. Prerequisite: Biological Sciences 110a–110b. Three lectures and one laboratory period per week. SPRING. [4] Graham and Zwiebel).

210. Principles of Genetics. Basic principles and mechanisms of inheritance are discussed and related to other biological phenomena and problems. Prerequisite: 102a–102b, Biological Sciences 110a–110b. FALL, SPRING. [3] Appel, Solnica-Krezel.

211. Genetics Laboratory. One three-hour laboratory and discussion period per week. May only be taken concurrently with, or following, 210. SPRING. [1] Cavener.

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

228. Introduction to Immunology. (Also listed as Biology 228) The molecular and cellular basis of immunity. Emphasis on molecular structure, the genetic origin of diversity in B-cell and T-cell receptors, antigen presentation, and the cellular interactions leading to the

immune response. Tolerance, tumor and transplantation immunity, autoimmune and immunodeficiency diseases, and allergy. Prerequisite: 201 or 210. SPRING. [3] Carter (Biology).

247. Molecular Evolution. (Also listed as Biology 247) 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 or Biology 202 or 205. [3] (Not currently offered)

255. Cell Physiology. Molecular biology of cell function and organization with emphasis on higher animals. Emphasis on macromolecular basis of action of cells, organelles and membranes, energy interconversions, nerve conduction, cell regulation, motility, and multicellularity. Prerequisite: 220. SPRING. [3] Fleischer.

258. Human Physiology. (Also listed as Biology 258, Molecular Physiology & Biophysics 281) Fundamental mechanisms of the major human physiological systems (nervous, circulatory, digestive, renal, muscular, endocrine, and reproductive). Emphasis on mechanisms of control and homeostasis and the integrated physiological response of the organism to external influences and disease states. Prerequisite: 220 or Biology 201. SPRING. [3] Oeltmann and Staff.

261. Introduction to Structural Molecular Biology. The ways in which light and other forms of electromagnetic radiation interact with biological molecules to reveal their structures. Topics include fluorescence, circular dichroism, x-ray crystallography, NMR and electron microscopy. Structures of proteins, nucleic acids and their assemblies as determined by these approaches. Prerequisite: 220. [3] (Not currently offered)

262. Biomolecular Interactions. Energetics and kinetics of interactions between proteins and nucleic acids and their ligands. Topics include cooperativity, allostery, rates of binding reactions. Students will gain direct experience in computer use, but no programming is required. Prerequisite: 220 and Physics 117a–117b. One lecture and two calculation sessions per week. SPRING. [3] Williams.

265. Biochemistry II. Lipid, amino acid, and nucleotide metabolism. Biochemistry of the expression and transmission of genetic information. Molecular physiology. Prerequisite: 220. SPRING. [3] Fanning.

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: 220 and either 210 or 265. FALL. [3] LeStourgeon.

277. Protein Design. Protein structural motifs and the underlying physical principles. Methods of protein structural analysis, experimental and theoretical, including the use of computer graphics, database searching and analysis, and structural prediction. The design and expression of mutant, chimeric, and *de novo* proteins. Prerequisite: 210 and 220; or IGP 300a. FALL. [3] Staros and Krezel.

320. Seminar in Molecular Biology. FALL, SPRING. [1] Mosig.

325. Dynamic Organization of Nuclear Function. Functional interrelationships between chromatin, transcription, replication. Molecular basis for the compartmentalization of gene

expression and how nuclear structures and substructures contribute to overall nuclear function. Prerequisite: IGP 300a. SPRING. [3] (Not offered 1999/2000)

326. The RNA World. Structure and function of RNA molecules involved in multiple cellular processes including replication, transcription, RNA processing, and translation. How modern DNA-based organisms evolved from a pre-biotic RNA world and how RNAs play a role in the regulation of gene expression. Prerequisite: IGP 300a. FALL. [2] (Not offered 1999/2000)

327. Developmental Biology of Microorganisms. Molecular basis of developmental programs in microorganisms. Regulation of the programs and on the signaling mechanisms underlying cell-environment and cell-cell interactions involved in the regulation. Organisms to be examined include: Bacillus subtilis, Myxococcus xanthus, Caulobacter crescentus, and Dictyostelium discoidewm. Prerequisite: IGP 300a. SPRING. [2] Singleton.

328. Microbial Genetics. (Also listed as Microbiology and Immunology 328) The genetics of bacteria and yeast and their use in molecular biology as an experimental tool. Prerequisite: IGP 300a. FALL. [2] Graham and N. Green (Microbiology and Immunology)

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

349. Graduate Seminar in Molecular Biophysics. (Also listed as Biochemistry 349) Lectures and discussions on a topic, which will change each year, in the area of molecular biophysics. May be repeated for credit. Prerequisite: consent of instructor. SPRING. [1] Stubbs and Staff.

361. Fundamentals of Molecular Biophysics. Physical properties of biologically important molecules and molecular assemblies. Topics include the conformational and dynamic properties of proteins and nucleic acids and of molecular assemblies and molecular motors, as revealed by microscopic and spectroscopic methods. Prerequisites: a semester of physics, a semester of calculus and IGP 300a or equivalent. FALL. [3] Williams and Staff.

362. Macromolecular Structure Determination by High Field NMR. Principles of structure determination of biological macromolecules by high field nuclear magnetic resonance spectroscopy. Prerequisites: one semester of biochemistry and two semesters of spectroscopy. Prerequisites: one semester of biochemistry and two semesters of calculus. SPRING. [2] (Not offered 1999/2000)

363. Macromolecular Structure Determination by X-Ray Diffraction. Principles of structure determination of biological macromolecules and assemblies by x-ray diffraction. Prerequisites: one semester of biochemistry and two semesters of calculus. SPRING. [2] (Not offered 1999/2000)

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

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

399. Ph.D. Dissertation Research.

Molecular Physiology and Biophysics

CHAIR Alan D. Cherrington
VICE CHAIR OF THE DEPARTMENT Albert H. Beth
DIRECTOR OF GRADUATE STUDIES Roger J. Colbran
PROFESSORS Albert H. Beth, G. Roger Chalkley, Alan D. Cherrington, Jackie D. Corbin,
    John H. Exton, Daryl K. Granner, Steven C. Hebert, David M. Lovinger,
    Mark A. Magnuson, Jane H. Park, Roland W. Stein, David H. Wasserman,
    P. Anthony Weil
RESEARCH PROFESSOR Sharron H. Francis
ASSOCIATE PROFESSORS Joseph M. Beechem, Matthew D. Breyer, Stephen N. Davis,
    Ronald B. Emeson, Jonathan L. Haines, James M. May, Owen P. McGuinness,
    David W. Piston, Linda Sealy
ASSISTANT PROFESSORS Roger J. Colbran, Robert Kesterson, Jason H. Moore,
    Richard M. O'Brien, Alvin C. Powers, James S. Sutcliffe, Danny G. Winder
RESEARCH ASSISTANT PROFESSORS Cynthia C. Connolly, Robert K. Hall,
    Mary C. Moore, Richard L. Printz, Masakazu Shiota
INSTRUCTORS Charles E. Cobb, Marion V. Turko, Richard R. Whitesell
RESEARCH INSTRUCTORS Chang An Chu, Eric Hustedt, Rekha Pattaneayek,
    Catherine Postic

DEGREE OFFERED: *Doctor of Philosophy*

❧ STUDENTS interested in this program participate in the Interdisciplinary Graduate Program in the Biomedical Sciences during the first year (see Biomedical Sciences). The second year comprises required and elective courses in molecular physiology or 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.

The emphasis of the graduate program is on research and research training in the areas of molecular and cell biology, cellular regulation and endocrinology, transport and biophysics, whole animal physiology, and genetics. Students obtain a general background in physiology, biochemistry, molecular biology, and genetics through course work and laboratory exercises. Students are encouraged to rotate freely among various research laboratories with interests in the areas mentioned above in order to select a particular area and thesis adviser for dissertation research.

Research areas available to the student include hormonal and developmental aspects of gene control at the molecular level, with emphasis on the role played by DNA-protein interactions. There is also a focus on cellular aspects of hormonal regulation including mechanisms of glucose, fatty acid

and ion transport, as well as the mechanism of action of hormonal second messengers such as cAMP, cGMP, and Ca^{2+}. 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 disorders and obesity is also ongoing in the department. Research in the department has relevance to a range of human diseases including diabetes, cancer, nutritional deficiencies, and developmental abnormalities.

310. Medical Scientist Training Program: Seminar Series. Designed for those students enrolled in the joint M.D./Ph.D. program. Guest lecturers, oral presentations by the students and sessions with the basic science departments on current research. Limited enrollment. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [1] Staff.

321. Physiology. Lectures and clinical correlations designed to cover the essentials in physiology for first year medical students. It or its equivalent is also required of all graduate students majoring in molecular physiology and biophysics. Class meeting dates are determined by the calendar of the School of Medicine. SPRING. [5] McGuinness and Staff.

322. Physiological Techniques and Preparations. Designed for advanced students. FALL, SPRING, SUMMER. Hours and credit by arrangement. Cherrington and Staff.

323. Excitable Membrane Properties in Nerve and Muscle. (Also listed as Pharmacology 323 and Neuroscience 324) Recent findings concerning the structure, function, and pharmacology of ion channels. Topics will include the relationship between amino acid sequence, protein subunit structure, and function of both voltage- and ligand-gated channels; the relationship between channel structure and pharmacology; the interaction of drugs with channels and receptor/channel proteins, with special emphasis on the interaction of compounds with different functional channel states; indirect coupling between ion channels and neurotransmitter and hormone receptors. Classes will include both presentations by the instructors and discussion of recent publications by students. Prerequisite: consent of instructor. FALL. [3] Lovinger, DeFelice (Pharmacology).

324. Tutorials in Physiology. Graduate students meet and critically evaluate research publications in the areas of molecular biology, membrane transport, intercellular signalling, and regulation of intermediary metabolism. FALL, SPRING. [1] Sutcliffe.

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 orthopaedics and rehabilitation. Invited speakers will discuss the clinical and scientific aspects of the above topics. Prerequisite: consent of instructor. SPRING. [1] Wasserman.

327. Molecular Endocrinology. A survey of the molecular biology of hormone action from the target cell surface to the nucleus, equally divided between steroid, thyroid, and peptide hormones. Special emphasis on how receptors and intracellular messengers mediate hormone action. Demonstration of the use of genetic and molecular biology techniques to study hormone action. Analysis of hormone effects on specific gene transcription. Prerequisite: Physiology 321 or consent of instructor. FALL. [2] Colbran, Magnuson, and O'Brien.

328. Metabolic Regulation *in vivo*. The hormonal regulation of fuel metabolism in the whole animal. Techniques used to study carbohydrate, lipid, and protein metabolism *in vivo* as well as metabolic regulation in the normal and stressed state. Conditions such as

fasting, exercise, infection, and hypoglycemia. A basic knowledge of physiology and biochemistry are required. Prerequisite: Physiology 321 or consent of instructor. FALL. [2] McGuinness and Staff.

330. Human Physiology and Molecular Medicine. Lectures and research correlations on advanced aspects of human physiology, with emphasis on communication between and control of the major tissue types and organ systems. Attention will also be directed toward application and integration of recent biochemical and molecular biology research findings to physiology and pathophysiology. This course (or 321 for M.D./Ph.D. students) is required of all graduate students majoring in Molecular Physiology and Biophysics. Prerequisite: 321 or Bioregulation 300A and 300B or consent of instructor. FALL. [3] Cobb and Staff.

332. Regulation of Gene Transcription. Factors affecting DNA/protein interactions. The most recent findings on how such interactions are established within the chromosomal environment and how those interactions affect gene activity. Hormonal and developmental aspects of gene control within the context of protein/DNA interactions. Prerequisite: Biochemistry 321 or consent of instructors. SPRING. [2] Weil and Staff.

340. Human Genetics. Designed to cover background and latest advances in human genetics. Topics will include an overview of mutational mechanisms, cytogenetics (detection and description of chromosomal abnormalities), biochemical genetics (gene defects in biochemical pathways), molecular genetics (gene structure, function, and expression), population genetics (heritability, quantitative traits, variance analysis), gene mapping (positional cloning, statistical and molecular techniques), and genetic epidemiology (genetic linkage analysis, design of gene mapping studies, gene-environment interaction). Topics will be discussed with reference to specific human genetic diseases. Prerequisites: Consent of instructor. SPRING. [3] Haines, Sutcliffe, and Staff.

345. Cellular and Integrative Neuroscience. (Also listed as Neuroscience 345, Pharmacology 345, Cell Biology 345) This course provides a broad survey of current issues in cellular and integrative Neuroscience. The course is divided into four sections. Section I (Overview/Introduction) gives an introduction and overview of current issues in systems neuroscience. Section II (Nervous System Development) considers several current issues in developmental neurobiology using examples from the development of the visual system in both vertebrates and invertebrates. Section III (Chemical & Electrical Signaling) introduces contemporary issues concerning signaling molecules, transmitters, receptors, and channels. Finally, Section IV (Neural Networks/Learning and Memory) discusses mechanism and models of synaptic plasticity. This course uses original articles with an emphasis on discussion and student participation rather than lectures. Students are expected to come to class prepared to debate and discuss details of assigned papers. This course is the required entry level course for a Neuroscience Ph.D. degree at Vanderbilt. Prerequisites: basic courses in Biology (preferably Neurobiology) and Chemistry. SPRING [4] Sanders-Bush and Staff.

355. Physical Methods for Investigating Nucleic Acid-Protein Interactions. A survey of biophysical techniques for investigating nucleic acid-protein interactions. Equal emphasis will be placed on the fundamental principles governing the experimental techniques and how these techniques are used to further our understanding of the structure, dynamics, and function of biological systems. Prerequisite: one year of calculus and one year of physics or consent of instructor. [3] Beechem and Edwards.

399. Ph.D. Dissertation Research.

Neuroscience

DIRECTOR Elaine Sanders-Bush

PROFESSORS Randy D. Blakely, Vivien A. Casagrande, Louis J. DeFelice, Ariel Deutch, Ford F. Ebner, Doyle G. Graham, Brigid L. M. Hogan, Jon H. Kaas, Lee E. Limbird, David M. Lovinger, Herbert Y. Meltzer, Elaine Sanders-Bush, Subramaniam Sriram, Kevin Strange, William O. Whetsell, Jr., Ronald G. Wiley, Robley C. Williams, Jr.

ASSOCIATE PROFESSORS Ronald B. Emeson, Albert L. George, Jr., Jonathan Haines, David M. Miller III

ASSISTANT PROFESSORS Bruce H. Appel, Bruce D. Carter, Roger J. Colbran, Chand Desai, Robert A. Kesterson, Peter Kolodziej, Michael P. McDonald, Thomas Montine, Bih-Hwa Shieh, Liliana Solnica-Krezel, James S. Sutcliffe, William M. Valentine, Brian E. Wadzinski, Danny S. Winder, Laurence J. Zwiebel

DEGREE OFFERED: *Doctor of Philosophy*

❧ THE program of study provides a broad background in neuroscience and other biomedical disciplines, preparing a student for a career as a research investigator and teacher. Graduates are recruited for positions in academic institutions where the new discipline of neuroscience is growing rapidly, in government and research institutes, and in the biotechnology industry.

The Ph.D. program requires a minimum of 28 hours of formal course work Two areas of focus (tracks) are available: molecular and integrative. Students interested in the molecular track have the option of participating in the IGP (see Biomedical Sciences). The first required neuroscience course, Cellular and Integrative Neuroscience, is taught in the second semester of the first year. This course surveys the broad area of neuroscience and is designed to link fundamental neuroscience to contemporary research. Additional required courses include structural and functional neuroanatomy with an emphasis on the relationship to neurologic and neuropsychiatric diseases and advanced courses covering the electrical properties of nerves and molecular neuroscience and biostatistics. An individualized elective schedule is designed that augments the required material in areas that relate directly to the chosen research, which begins in the summer of the first year. Areas of study include molecular neuroscience, neural development, synaptic transmission, synaptic and systems plasticity, sensory processing, neuropharmacology, neurotoxicology, neurogenetics, and the etiology and treatment of neuropsychiatric and neurodegenerative diseases. An original research dissertation is required for the Ph.D. degree.

201. Neuroscience. (Also listed as Psychology 201) A comprehensive introduction to the field of neuroscience from important molecules to cell function to neural systems to cognition. Topics include the physiology of nerve cells, the sensory systems of vision, audition and touch, the motor system, sleep, consciousness, speech and sexual behavior. Coverage of

clinical topics includes the chemical basis of the psychoses, diseases of the brain, and repair mechanisms after brain injury. FALL, SPRING. [3] L. Smith.

323. The Nervous System. (Also listed as Cell Biology 323) Emphasis on providing second-year medical students and graduate students with a solid understanding of the organization of the human central nervous system, integrating basic information from neuroanatomy, neurophysiology, and neurochemistry. Covers the most up-to-date research conducted in neurobiology, with emphasis on research with potential clinical significance. Clinical material is provided by patient presentations, discussions of the impact of neurological disease on patients and their loved ones, and by an analysis of pathological cases. Four hours lecture and four hours laboratory per week. Microscope rental fee is required. FALL [3–4] Norden.

324. Excitable Membrane Properties in Nerve and Muscle. (Also listed as Pharmacology 323 and Molecular Physiology and Biophysics 323) Recent findings concerning the structure, function, and pharmacology of ion channels. Topics will include the relationship between amino acid sequence, protein subunit structure, and function of both voltage- and ligand-gated channels; the relationship between channel structure and pharmacology; the interaction of drugs with channels and receptor/channel proteins, with special emphasis on the interaction of compounds with different functional channel states; indirect coupling between ion channels and neurotransmitter and hormone receptors. Classes will include both presentations by the instructors and discussion of recent publications by students. Prerequisite: consent of instructor. FALL. [3] Lovinger, DeFelice (Pharmacology).

329. Molecular Basis of Psychotropic Drug Action. (Also listed as Pharmacology 329) This advanced course focuses on the mechanism of action of CNS-active drugs, with extensive literature reading and student presentations. Each section will focus on the mechanism of action of a drug class, including classical behavioral and biochemical studies, as well as genetic and molecular analyses of drug action. This course is offered as a module in the second half of the spring semester. It can be taken along with Neuroscience 346 to meet a neuroscience Ph.D. program requirement or separately as an elective. Prerequisite: 345, 346, Pharmacology 324–325, or consent of instructor. SPRING, SECOND MODULE. [2] Sanders-Bush.

335. Special Topics in Neuroscience (Also listed as Cell Biology 335 and Psychology 335). Explores basic issues in neuroscience. Possible topics include neural development, neural plasticity, regeneration, organization and function of cortex, sensory systems, motor systems, and research methodology in neuroscience. A new topic is considered each semester. Prerequisite: Neuroscience 323 or equivalent course. FALL. [2] Casagrande.

336. Advanced Neuroanatomy (Also listed as Cell Biology 336). Designed for graduate and medical students who want to explore in more detail topics covered in Neuroscience 323. Emphasis on advanced neuroanatomical techniques (electron microscopy, freeze-fracture, fluorescence microscopy), on an understanding of original current research conducted in neuroanatomy, and on clinical correlations. Students may elect to emphasize clinical correlations and do three five-week rotations in various subfields of neurobiology (neuro-oncology, surgery, etc.). Admission by consent of instructor. FALL, SPRING, SUMMER. [2] Norden.

345. Cellular and Integrative Neuroscience. (Also listed as Cell Biology 345, Pharmacology 345, Molecular Physiology and Biophysics 345) This course provides a broad survey of current issues in cellular and integrative Neuroscience. The course is divided into four sections. Section I (Overview/Introduction) gives an introduction and overview of current issues in systems neuroscience. Section II (Nervous System Development) considers sev-

eral current issues in developmental neurobiology using examples from the development of the visual system in both vertebrates and invertebrates. Section III (Chemical & Electrical Signaling) introduces contemporary issues concerning signaling molecules, transmitters, receptors, and channels. Finally, Section IV (Neural Networks/Learning and Memory) discusses mechanism and models of synaptic plasticity. This course uses original articles with an emphasis on discussion and student participation rather than lectures. Students are expected to come to class prepared to debate and discuss details of assigned papers. This course is the required entry level course for a Neuroscience Ph.D. degree at Vanderbilt. Prerequisites: basic courses in Biology (preferably Neurobiology) and Chemistry. SPRING [4] Casagrande and Staff.

346. 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. This course is offered as a module in the first half of the spring semester. It can be taken along with Neuroscience 329, 356, or 366 to meet a neuroscience Ph.D. program requirement or separately as an elective. Prerequisite: 345, Pharmacology 324–325, or consent of instructor. SPRING. [3] Blakely, Emeson, and Staff.

347. The Visual System. (Also listed as Cell Biology 347, Psychology 336, Electrical and Computer Engineering 351) An interdisciplinary approach to how humans see and interpret their visual environment. Topics include the structure of the eye and brain (including optics), the physiology of individual cells and groups of cells, machine vision and models of visual function, visual attention, and mechanisms of complex visual perception. Lectures by faculty from Psychology, Engineering, and Cell 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] Casagrande, Bonds (Electrical and Computer Engineering).

350. Independent Study. Qualified students work with individual faculty members in areas not covered in available courses. Prerequisite: approval by individual faculty member and program director. FALL, SPRING, SUMMER. [Variable credit: 1–3, with total credit limited to 3]

356. Molecular Neural Development. This course covers the molecular mechanisms underlying the wiring of the nervous system, the formation of synapses, and neural patterning. Students will be introduced to molecules directing or prohibiting the migration of axons, molecules that identify appropriate synaptic partners, and the plasticity involved in these processes. The material covered will enhance the student's understanding of molecular events leading to the proper formation of the nervous system during development and how dysfunction of these molecules could lead to maldevelopment. This course is offered as a module in the first half of the spring semester. It can be taken along with Neuroscience 346 to meet a neuroscience Ph.D. program requirement or separately as an elective. Prerequisite: 345, 346, or consent of instructor. SPRING, FIRST MODULE. [3] Blakely, Emeson, and Staff.

366. Molecular Basis of Neural Disease. This advanced course covers current concepts and models for brain and peripheral neural diseases, including genetic and environmentally based disorders. The course will combine didactic and research presentations to review the identification and characterization of defective or misexpressed molecules that increase risk or lead directly to neural diseases. Topics to be covered include simple and

complex trait disorders, trinucleotide repeat syndromes, disorders or myelination, move-ment disorders, dementia and Alzheimer's disease, and pain. This course is offered as a module in the second half of the spring semester. It can be taken along with Neuroscience 346 to meet a neuroscience Ph.D. program requirement or separately as an elective. Pre-requisite: 345, 346, or consent of instructor. SPRING, SECOND MODULE. [2] MONTINE.

399. Ph.D. Dissertation Research.

Nursing Science

DEAN Colleen Conway-Welch
PROFESSORS Colleen Conway-Welch, Larry E. Lancaster, Judy Ozbolt,
    Kenneth A. Wallston
ASSOCIATE PROFESSOR Lynda L. LaMontagne
RESEARCH ASSOCIATE PROFESSOR Nancy Wells
ASSISTANT PROFESSORS Janet Carpenter, Thomas H. Cook, Karen D'Apolito,
    Kathleen A. Dwyer, Mary Jo Gilmer, Rolanda Johnson, Melanie Lutenbacher
RESEARCH ASSISTANT PROFESSOR Carole Ann Bach

DEGREE OFFERED: *Doctor of Philosophy*

❧ THE program prepares scholars for research and teaching careers in major universities and for research positions in public or private sectors of health care. Fields of study emphasize individual, family, and commu-nity responses to health and illness across the life span as well as out-comes of care delivery practices.

The program requires 72 credit hours of study, of which 18 may be transferred from master's course work pending review and approval by graduate faculty. The two-year core curriculum of the program (a mini-mum of 42 hours of formal course work) is organized into three broad areas: phenomena of concern in nursing science; scientific inquiry, includ-ing application, testing and generation of theory; and a minor in an area that supports the student's focus of study. Program requirements include successful progression through advanced course work and completion of two qualifying papers, an oral qualifying examination, and a dissertation (including oral defense of proposal and findings). Within the doctoral level course work are research practica in which students work with ongoing faculty research projects. Full-time and part-time options are available.

342. Theory Development in Nursing. Examination and critique of structural components and processes used for theory building in nursing. Students examine the nature of theory, theory development as a process and the organization of knowledge for nursing. FALL. [3] LaMontagne.

351. Scientific Basis of Nursing Therapeutics. Critical appraisal of the scientific basis for commonly used therapeutic interventions in nursing. Theories and research generated to study nursing therapeutics are evaluated. Strategies for discovering new knowledge related to therapeutics and for synthesizing extant knowledge are discussed. SUMMER. [3] Wells.

363. Human Responses in Health and Illness. Critical analysis of factors known to influence human responses in health and illness states, using a broad stress and coping perspective as well as theoretical orientations guiding research on human health and illness. Students conduct a critical and reflective analysis of existing and emerging scientific knowledge in a chosen field of study. SPRING. [3] LaMontagne.

365. Family Adaptation in Health and Illness. Exploration and analysis of current theoretical and empirical approaches to understanding factors that affect health status of families, especially childbearing and child-rearing families and those with members who have chronic illness or conditions. Seminar is topical in nature, with presentations by faculty investigators, visiting faculty, and students. [3] Dwyer.

368. Health and Environment. Explores and critically analyzes the current theoretical and empirical approaches to understanding the interaction of health and environment in affecting individuals' health. Health behaviors that arise from persons and from environmental factors are discussed. Conceptualizations of health, health promotion behaviors and prevention of disease are examined in an environmental context. FALL. [3] Staff.

379. Special Topics in Nursing Science. Discussion of research and current developments of special interest to faculty and students. FALL, SPRING, SUMMER. [Variable credit: 1–3] Staff.

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. FALL, SPRING, SUMMER. [Variable credit: 1–3] Staff.

392. Comparative Research Methods. Overview and comparison of quantitative and qualitative methods and designs for nursing research. Course is divided into two segments: the first covers general issues associated with the conduct and critical review of research; the second covers research designs associated with nursing and health-related research. FALL. [3] Staff.

393. Quantitative Research Methods. In-depth analysis of quantitative research methods employed in nursing and health-related research, focusing on topics such as design, sampling, and instrumentation. An elementary knowledge of statistics is assumed. Students develop a research instrument and write a proposal to establish its psychometric properties. SPRING. [3] Wallston.

394. Qualitative Research Methods. Focuses on qualitative approaches to research, including theoretical foundations and practical applications. In-depth study of selected methods. SUMMER. [3] Dwyer.

395. Research Practicum. Provides students with exposure to and involvement in the research process. Learning activities are based on student need and interest and determined according to fit with available faculty research programs. FALL, SPRING, SUMMER. [Variable credit 1–3] Staff (doctoral program faculty).

393. Quantitative Research Methods. In-depth analysis of quantitative research methods employed in nursing and health-related research, focusing on topics such as design, sampling, and instrumentation. An elementary knowledge of statistics is assumed. Students develop a research instrument and write a proposal to establish its psychometric properties. SPRING. [3] Wallston.

396. Univariate and Bivariate Statistics for the Health Sciences. Introduction to univariate descriptive/exploratory and bivariate inferential statistics for use with research designs relevant to the health sciences. Includes basic epidemiological statistics and exploratory data analytic techniques. Emphasizes use of SPSS-PC and interpretation of output generated by the SPSS-PC program. FALL. [3] Wallston and Hepworth.

397. Multivariate Statistics for the Health Sciences. An intermediate level course in multivariate inferential statistics. Topics include N-way, ANOVA, ANCOVA, MANOVA, MANCOVA, multiple linear regression, logistic regression, factor analysis, cluster analysis, discriminant function analysis, survival analysis, path analysis, and introduction to structural equation modeling. Emphasizes use of SPSS-PC and interpretation of output generated by the SPSS-PC program. SPRING. [3] Wallston and Hepworth.

399. Ph.D. Dissertation Research.

Pathology

See Cellular and Molecular Pathology

Pharmacology

INTERIM CHAIR Elaine Sanders-Bush
DIRECTOR OF GRADUATE STUDIES Ronald B. Emeson
PROFESSORS EMERITI Allan D. Bass, Wolf-D. Dettbarn, Joel G. Hardman, Steven E. Mayer,
     B. V. Rama Sastry
PROFESSORS Randy D. Blakely, Alan R. Brash, Richard Caprioli, John E. Chapman,
     Louis J. DeFelice, Ariel Y. Deutch, Michael H. Ebert, John H. Exton, Sidney Fleischer,
     Alfred L. George, Jr., Kenneth R. Hande, Steven C. Hebert, Lee E. Limbird,
     David M. Lovinger, Peter R. Martin, Herbert Y. Meltzer, John A. Oates,
     L. Jackson Roberts II, David Robertson, Dan M. Roden, Elaine Sanders-Bush,
     Kevin Strange, Fridolin Sulser, Douglas E. Vaughan, Jack N. Wells, Ronald G. Wiley,
     Grant R. Wilkinson, Alastair J. J. Wood
RESEARCH PROFESSOR Sydney Spector
ASSOCIATE PROFESSOR EMERITUS Erwin J. Landon
ASSOCIATE PROFESSORS Joseph A. Awad, Robert J. Barrett, M. Lawrence Berman,
     Italo Biaggioni, Peter R. Bieck, Richard M. Breyer, Ronald B. Emeson, Robert D. Hunt,
     Michael J. McLean, Jason D. Morrow, John J. Murray, Katherine T. Murray, Peter W. Reed,
     Jeff Rottman, Richard C. Shelton
ASSISTANT PROFESSORS Mark Anderson, Joey V. Barnett, Nancy J. Brown, Chand Desai,
     Christoph M. Fahlke, William A. Hewlett, Samuel F. Hunter, Junji Ichikawa,
     Richard B. Kim, Sabina Kuperschmidt, MacRae Linton, Thomas J. Montine,
     Bih-Hwa Shieh, C. Michael Stein, Brian E. Wadzinski
RESEARCH ASSISTANT PROFESSORS Sammanda Ramamoorthy, Margaret Sutherland,
     Rema Velayudhan
ADJUNCT ASSISTANT PROFESSORS Sukhbir S. Mokha, Emmanual Onaivi
INSTRUCTORS Jon R. Backstrom, Sally Schroeter
RESEARCH INSTRUCTORS Li Nie, Dao Wu Wang, Tao Yang

DEGREE OFFERED: *Doctor of Philosophy*

❦ STUDENTS interested in this program 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.

The Ph.D. program includes 28 hours of required course work. 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 and biophysics, and chemistry. The first year is devoted to general study and research rotations as part of the IGP curriculum. 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.

320. Pharmacological Targets and Mechanisms. Introduction to i*n vivo*physiological mechanisms, anatomical structure of organ systems, and regulatory feedback pathways responsible for drug metabolism and physiological homeostasis. Classical studies that shifted the paradigm in a particular area and contemporary research will be discussed to demonstrate clarity of thinking, focused experimental strategies leading to genuine discovery, as well as potential difficulties in interpretation of results of experiments. FALL. [3] Barnett, Brash.

321. Principles of Drug Action. The mechanisms of drug action are taken up in a systematic manner. Course includes didactic lectures and parallel guided readings on drug discovery and design, based on current advances in basic science and clinical research. SPRING. [4] Barnett, Brash.

322. Scientific Communication Skills. Techniques in effective oral communication of scientific research as well as practical experience in research and literature presentation and in the preparation of grant proposals. FALL. [1] Desai.

323. Excitable Membrane Properties in Nerve and Muscle. (Also listed as Molecular Physiology and Biophysics 323 and Neuroscience 324) Recent findings concerning the structure, function, and pharmacology of ion channels. Topics will include the relationship between amino acid sequence, protein subunit structure, and function of both voltage- and ligand-gated channels; the relationship between channel structure and pharmacology; the interaction of drugs with channels and receptor/channel proteins, with special emphasis on the interaction of compounds with different functional channel states; indirect coupling between ion channels and neurotransmitter and hormone receptors. Classes will include both presentations by the instructors and discussion of recent publications by students. Prerequisite: consent of instructor. FALL. [3] DeFelice, Lovinger.

324. Receptor Theory, Cell-Surface Receptors, and Signal Transduction Pathways. (Also listed as Biochemistry 324) 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. [3] Breyer, Shieh, Wadzinski.

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. [2] Barnett.

329. Pharmacology of Psychotropic Drugs and Drug Abuse. (Also listed as Neuroscience 329) An advanced course that focuses on the mechanism of action of CNS-active drugs, with extensive literature reading and student presentations. Prerequisites: 320, 345, or consent of instructor. SPRING. [2] Sanders-Bush.

332. Biostatistics Short Course. Introduction to confidence intervals, SD, SEM, and the Gaussian distribution, P values and hypothesis, modeling and linear regression, nonlinear regression, analysis of variance, and use of software programs for biostatistical research. The course is examined via interactive scientific problems and examples with Dr. Harvey Motulsky, originator of the statistical analysis software package utilized in the course and author of the textbook *Intuitive Biostatistics*. SUMMER. [1] Staff.

345. Cellular and Integrative Neuroscience. (Also listed as Cell Biology 345, Neuroscience 345, Molecular Physiology and Biophysics 345) This course provides a broad survey of current issues in cellular and integrative Neuroscience. The course is divided into four sections. Section I (Overview/Introduction) gives an introduction and overview of current issues in systems neuroscience. Section II (Nervous System Development) considers several current issues in developmental neurobiology using examples from the development of the visual system in both vertebrates and invertebrates. Section III (Chemical & Electrical Signaling) introduces contemporary issues concerning signaling molecules, transmitters, receptors, and channels. Finally, Section IV (Neural Networks/Learning and Memory) discusses mechanism and models of synaptic plasticity. This course uses original articles with an emphasis on discussion and student participation rather than lectures. Students are expected to come to class prepared to debate and discuss details of assigned papers. This course is the required entry level course for a Neuroscience Ph.D. degree at Vanderbilt. Prerequisites: basic courses in Biology (preferably Neurobiology) and Chemistry. SPRING [4] Sanders-Bush and Staff.

346. Molecular Neurobiology (Also listed as Neuroscience 346). This course examines molecular components and interactions that regulate neuronal development, signaling, and disease. Topics include development of neuronal identity, axonal transport, growth factors and cell death, axon guidance and synapse formation, electrical and chemical transmission, regulation of neuronal excitability and genetic analysis of signaling and neural disorders. The course features didactic and literature discussions to introduce and cover key molecular mechanisms. Prerequisite: 345, Pharmacology 320, undergraduate course in neurobiology or consent of instructor. SPRING. [3] Blakely, Emeson, Staff.

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: 1–4, with total credit limited to 4 hours] Staff.

360. Current Issues in Pharmacology. Presentation of current advances, paradigm shifts, and problems in Pharmacology with an emphasis on experimental approaches and their interpretation. Prerequisite: consent of instructor. SPRING. [variable credit: 1–3] Strange and Staff.

399. Ph.D. Dissertation Research.

Philosophy

CHAIR Michael P. Hodges
DIRECTOR OF GRADUATE STUDIES Henry A. Teloh
PROFESSORS EMERITI John J. Compton, Clement Dore, Donald W. Sherburne
PROFESSORS Jay M. Bernstein, Lenn E. Goodman, Michael P. Hodges, John Lachs,
    John F. Post, Henry A. Teloh, David Wood, Richard M. Zaner
ASSOCIATE PROFESSORS Idit Dobbs-Weinstein, Robert R. Ehman, Elijah Millgram,
    Jeffrey S. Tlumak
ASSISTANT PROFESSORS Mark J. Bliton, Stuart G. Finder, Gregg M. Horowitz, José Medina

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

❧ EACH candidate for the master's degree must complete 24 hours of formal course work with a minor of at least 6 hours. The minor may include courses from philosophy or another discipline or disciplines, and it must form a coherent whole. The master's degree usually requires submission of a thesis, but an optional non-thesis plan is available to students admitted to candidacy for the Ph.D.

Work for the Ph.D. degree is offered in the fields of aesthetics, epistemology, ethics, history of philosophy, continental philosophy, American philosophy, metaphysics, philosophy of mind, philosophy of religion, philosophy of science, and political and social philosophy. Candidates must complete at least 48 hours of formal course work, including a minor of at least 12 hours. This work may include courses from within philosophy or another discipline or disciplines, and it must form a coherent whole.

Ability to use the philosophical literature in languages other than English is an important scholarly tool. Students are encouraged to read foreign language materials, and faculty members are encouraged to recommend them, during the regular program of course and seminar work. The language requirement is satisfied when a student completes an independent readings course (Philosophy 341, 342, or 343) using materi-

als in one foreign language, usually French, German, or Greek, or by making significant use of a foreign language in conjunction with a regular course offering. The department has special expertise in Arabic, Hebrew, and Latin, as well. The requirements of the course are both philosophical and linguistic and are worked out individually in each case.

202. Formal Logic and Its Applications. A self-contained course designed to convey an understanding of the concepts of modern formal logic, to develop convenient techniques of formal reasoning, and to make some applications of them in one or more of the following: psychology, linguistics, structuralist studies, information and computer sciences, and the foundations of mathematics. Philosophy 102 is not required. FALL. [3] Degnin.

206. Technology and Human Values. Moral problems arising out of the influence of technology on human life including pollution, population control, and individual privacy. [3] (Not currently offered)

210. Ancient Philosophy. (Also listed as Classics 210) An examination of the major Greek and Roman philosophers with emphasis on the works of Plato and Aristotle. FALL. [3] Teloh.

211. Medieval Philosophy. Comparative study of key figures in Islamic, Jewish, and Christian philosophy as they struggle with the philosophy of logic, metaphysics, language, culture, politics, ethics, and nature. SPRING. [3] Goodman.

212. Modern Philosophy. An examination of the major philosophers of modern Europe from Descartes and Spinoza through Locke, Berkeley, Hume, and Kant. SPRING. [3] Tlumak.

213. Contemporary Philosophy. An examination of selected problems treated in recent philosophical literature such as meaning, perception, knowledge, truth, and freedom. Readings from the Anglo American analytical and the phenomenological traditions. FALL. [3] Post.

217. Metaphysics. Selected problems in metaphysics such as ultimate explanation, meaning of existence, time and eternity, freedom and determinism, and science and religion. FALL. [3] Tlumak.

218. Hellenistic and Late Ancient Philosophy. (Also listed as Classics 218) Philosophical ideas of Stoics, Cynics, Epicureans, skeptics, Peripatetics, Neoplatonists, and early monotheist thinkers such as Philo, Origen, and Philoponus. [3] (Offered 2000/01)

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. FALL. [3] Millgram. (Offered 2000/01)

222. American Philosophy. A study of the works of selected American philosophers from the colonial period to the present. SPRING. [3] Hodges.

224. Existential Philosophy. A study of two or three existential philosophers and selected problems which arise in relation to their thought. SPRING. [3] Bernstein.

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. SPRING. [3] Zaner.

228. Nineteenth-Century Philosophy. A study of selected themes and writings from nineteenth-century European philosophers. SPRING. [3] Lachs.

231. Philosophy of History. Focus on alternative conceptions of time and history in Aristotle, Augustine, Kant, Hegel, Heidegger, and Benjamin. FALL. [3] Dobbs-Weinstein.

234. Philosophy of Education. Analysis of educational concepts. Educational implications of theories of knowledge and theories of the individual. Emphasis on higher education. SPRING. [3] Teloh.

235. Feminist Philosophy. Recent issues in feminist thought including the gender/sex distinction, sexuality, embodiment and feminist epistemology. SPRING. [3] Dobbs-Weinstein.

237. Ethics and Medicine. Selected ethical issues raised by clinical practice, medical theories, and biomedical research and technology. SPRING. [3] Bliton.

238. Contemporary Ethical Theory. A study of theories about the cognitive foundations of ethical discourses. Prerequisite: 105. SPRING. [3] Ehman.

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. Goodman. [3] (Offered 2000/01)

240. Aesthetics. The leading accounts of the nature of art, the character of aesthetic experience, the nature of artistic creation, and selected problems associated with art in specific media. FALL. [3] Horowitz.

241. Contemporary Issues of Aesthetics. Problems posed by contemporary art and by such nontraditional media as happenings of the sixties and earth works. Topics include the aims of art, the role of the spectator, conditions of interpretation and evaluation. SPRING. [3] Horowitz.

242. Philosophy of Religion. A study of various problems concerning religious experiences; ideas about religion and divinity. SPRING. [3] Tlumak.

243. Philosophy of Film. The challenges posed by film form to traditional aesthetics and the novel philosophical theories that have been created to deal with them. Topics may 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] Horowitz. (Offered 2000/01)

244. Philosophy and the Natural Sciences. Philosophical issues in the methodology, conceptual structure, patterns of explanation, historical development, cultural impact, and metaphysical and ethical implications of the natural sciences. Prerequisite: Satisfaction of the basic science requirement. FALL. [3] Leonard-Martin

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. SPRING. [3] Medina.

247. Kierkegaard and Nietzsche. A study of selected works. FALL. [3] Wood.

252. Political and Social Philosophy. A study of selected social and political theories. Critical analysis of the relevant works of Hegel, Marx, Lenin, Mill, Nietzsche, Gentile, and others. SPRING. [3] Teloh.

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. FALL. [3] Ehman.

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. SPRING. [3] Ehman.

255. Philosophy and Literary Theory. (Also listed as Comparative Literature 255.) A study of the relation between recent continental philosophy and theories of literature and of literary criticism. Selected works will be included. [3] (Not currently offered)

256. Philosophy of Mind. Selected problems in the philosophy of mind, such as the relationship between mind and body, the nature of consciousness, the problem of other minds, the status of self-knowledge, and the possibility of machine and other intelligence. Connections with empirical investigations in related cognitive disciplines. SPRING. [3] Medina.

258. Contemporary Political Philosophy. The emergence of post-liberal political thought. Topics include the politics of recognition, the specificity of political action, transformations in political theory as a consequence of gender, race, and environmental issues. These will be studied through examination of the writings of Hannah Arendt, Cornelius Casoriadis, Heidegger, Derrida, Habermas, etc. FALL. [3] Bernstein.

260. Twentieth-Century Continental Philosophy. (Also listed as Comparative Literature 260) A study of selected twentieth-century philosophers such as Derrida, Foucault, and Lacan. SPRING. [3] Wood.

294a–294b. Selected Topics. Students may enroll in more than one section per semester. [Credit: 3 each seminar, not to exceed 12 over a four-semester period] Staff.

310. Seminar: Theory of Knowledge. Various analyses of knowledge, the *a priori*, perception, and truth, as well as knowledge of other minds and the nature of empirical confirmation. SPRING. [3] Post.

312. Seminar: Plato. Selected dialogues of Plato. FALL. [3] Teloh.

314. Seminar in Medieval Philosophy. Central problems in Islamic, Judeo-Arabic, and Latin-Christian philosophical traditions. The nature of language and of human understanding. The nature of existence and being. [3] (Not currently offered)

318. Seminar: Contemporary Naturalism. The historical antecedents, logical foundations, and selected central theses of contemporary naturalism. Attention to naturalistic theories of consciousness, knowledge, and value. Readings from such philosophers as Santayana, Dewey, Sellars, Feigl, and Smart. [3] (Not currently offered)

320. Seminar: Metaphysics. Includes considerations of being, existence, universals, freedom, the self, mechanism vs. vitalism, and the methods and scope of metaphysics itself. [3] Goodman. (Not currently offered)

323. Seminar: Critical Theory. A study of selected topics including such first generation theorists as Benjamin, Adoro, and Horkheimer and such second generation theorists as Habermas. FALL. [3] Bernstein.

325. Seminar: Husserl. Selected works. [3] (Not currently offered)

326. Seminar: Heidegger. A study of *Being and Time*. FALL. [3] Wood.

327. Seminar: Heidegger after *Being and Time*. A study of selected works that appeared after *Being and Time*. [3] Wood. (Not currently offered)

328. Seminar: Philosophy of Religion. Philosophical interpretations of religion and of philosophical positions or problems arising within certain religious traditions. Topics will vary from year to year. [3] (Not currently offered)

329. Readings in Contemporary Continental Philosophy. A study of selected works. [3] Bernstein. (Not currently offered)

330. Seminar in Philosophy. Some fundamental philosophical problem or some leading philosophical system, varying with each offering. Topics for 1999/2000:
Neo-Pragmatisms. FALL. [3] Lachs.
Aesthetics. SPRING. [3] Horowitz.
Commentaries on Aristotle's *D Anima.* SPRING. [3] Dobbs-Weinstein.

332. Seminar: History of Philosophy. Topics for 1999/2000:
Hume. FALL. [3] Tlumak.
Wittgenstein. FALL. [3] Medina.
Kant. SPRING. [3] Bernstein.
Aristotle. SPRING. [3] Goodman.

335. Philosophy and Medicine: I. Epistemological, metaphysical, and methodological aspects of medicine from both historical and systematic perspectives. FALL. [3] Zaner.

336. Philosophy and Medicine: II. The ethical aspects of clinical and research medicine, and the basic concepts and methods of clinical and biomedical ethics. [3] Zaner.

340. Readings in Philosophy. Selected major philosophical works or a selected bibliography about a major philosophical problem. Appropriate reports and examination. FALL, SPRING. [Variable credit: 1–3] Staff.

341. Philosophical Readings in French. Selected major philosophical works or a selected bibliography about a major philosophical problem, read in French. A translation examination and appropriate reports. Completion with a *B* or better satisfies the department's language requirement. Prerequisite: four college semesters of French or equivalent; or a 550 or better score on the GSFLT in French. FALL, SPRING. [3] Staff.

342. Philosophical Readings in German. Selected major philosophical works or a selected bibliography on a major philosophical problem. A translation examination and appropriate reports. Completion of this course with a grade of *B* or better satisfies the department's language requirement. Prerequisite: four college semesters of German or equivalent; or a 550 or better score on the GSFLT in German. FALL, SPRING. [3] Staff.

343. Philosophical Readings in Classical Languages (Latin or Greek). The reading in Latin or Greek of selected major philosophical works or a selected bibliography on a major philosophical problem. A translation examination and appropriate reports. Completion of this course with the grade *B* or better satisfies the department's language requirement. Prerequisite: four college semesters of the appropriate language or equivalent. FALL, SPRING. [3] Staff.

344. Philosophical Readings in Logic. The reading of selected philosophical works in which one makes extensive use of or reflects upon some branch of logic. An examination and appropriate reports. Passing this course satisfies the department's logic requirement. Prerequisite: 202 or equivalent. FALL, SPRING. [3] Staff.

345. Hermeneutics. (Also listed as Comparative Literature 345) Study of the idea of interpretation, including the Bible in the Middle Ages and Homer in Antiquity. Modern philosophical and critical theories; Heidegger, Gadamer, Ricoeur, Fish, Dilthey. [3] (Not currently offered)

369. Master's Thesis Research. [0]

399. Ph.D. Dissertation Research.

Physics and Astronomy

CHAIR Richard F. Haglund, Jr.
DIRECTOR OF GRADUATE STUDIES Royal G. Albridge
DIRECTOR OF THE DYER OBSERVATORY Douglas S. Hall
PROFESSORS EMERITI Arnold M. Heiser, Wendell G. Holladay, E. A. Jones, P. Galen
    Lenhert, William T. Pinkston, C. E. Roos
PROFESSORS Royal G. Albridge, John Paul Barach, Charles A. Brau, David J. Ernst,
    Leonard C. Feldman, Richard F. Haglund, Jr., Douglas S. Hall, Joseph H. Hamilton,
    Charles F. Maguire, Volker E. Oberacker, Sokrates Theodore Pantelides,
    Robert S. Panvini, James A. Patton, Ronald R. Price, Akunuri V. Ramayya,
    Norman H. Tolk, Taylor G. Wang, Medford S. Webster, Thomas Joseph Weiler,
    John P. Wikswo, Jr.
RESEARCH PROFESSOR Arron B.Brill
ASSOCIATE PROFESSORS Frank E. Carroll, Jr., Charles William Coffey II,
    Steven E. Csorna, Thomas W. Kephart, Paul D. Sheldon, A. Sait Umar, David A. Wein-
    traub, Robert A. Weller
RESEARCH ASSOCIATE PROFESSORS Marcus H. Mendenhall, James W. Waters
ASSISTANT PROFESSORS Dennis Michael Duggan, Senta V. Greene, Ilias E. Perakis,
    David W. Piston, Lou Reinisch, Didier Saumon
RESEARCH ASSISTANT PROFESSORS Rubin Aliev, J. M. Gilligan, Shien-Fong Lin,
    Gunter Lupke, Yu Pei Ma

DEGREES OFFERED:

PHYSICS. *Master of Arts, Master of Science, Doctor of Philosophy*
ASTRONOMY. *Master of Science*

❧ AS fundamental sciences, physics and astronomy continue to be driving intellectual forces in expanding our understanding of the universe, in discovering the scientific basis for new technologies, and in applying these technologies to research. In keeping with this role, the Department of Physics and Astronomy has active research groups studying the physics of elementary particles; nuclear structure and heavy-ion reactions; the behavior of electrons, atoms, molecules, and photons in the two-dimensional world near surfaces; nonlinear optical physics of nanocrystals, surfaces, and interfaces; the electric and magnetic properties of living systems; the structure and dynamics of biopolymers; computational physics; unusual, low-mass and young stars, extrasolar planets, and star clusters; and cosmology.

The master's 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 program usually submit a thesis; however, a non-thesis option 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. For information regarding the Master of Science degree in medical physics, see the medical physics section.

The Ph.D. degree requires at least 72 hours of graduate work, including 22 hours of formal core courses, one semester of advanced quantum physics, and 14 hours of elective courses. The remaining credit hours may be earned through some combination of dissertation research and approved lecture courses. The master's degree in astronomy requires a minimum of 24 credit hours, of which 12 are to be chosen from the astronomy course offerings. The master's program in astronomy normally requires four semesters and includes an oral examination.

Physics

210. Introduction to Electronics. (Also listed as Electrical Engineering 200, Elements of Electrical Engineering) An introduction to passive and active circuits. Direct-current and alternating-current circuits, power supplies, amplifiers, oscillators, wave-shaping, and switching circuits. Emphasis on the operational characteristics of these circuits. Prerequisite: Math 175. SPRING. [3] Staff of the Department of Electrical Engineering.

221. Classical and Modern Optics. Geometrical optics: reflection, refraction, ray tracing, aberrations, interference. Physical optics: wave theory, absorption, dispersion, diffraction, polarization. Properties of light from lasers and synchrotron sources; photodetectors; optical technology. No credit for graduate students in physics. SPRING. [3] Sheldon.

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. SPRING. [3] Staff.

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. FALL. [3] Wikswo.

225a–225b. Introduction to Quantum Physics and Applications. A survey of modern physics using elementary quantum mechanics. 225a: Atomic and molecular structure and spectroscopy. Solid state physics. 225b: Nuclear structure decay and reactions. Properties and classifications of elementary particles. Recommended: Mathematics 198. [4-4] Feldman and Csorna.

227a–227b. Intermediate Classical Mechanics. 227a: Vector algebra and coordinate transformations; orbital and rotational angular momentum; gravitational and Coulomb central-force problems; free, forced, damped and nonlinear harmonic oscillations; chaos in simple mechanical systems. 227b: Normal modes; rigid-body motion; special relativity; Lagrangian and Hamiltonian descriptions of classical mechanics; continuum mechanics. Prerequisite for 227a: Mathematics 170 or equivalent. Recommended corequisite for 227b: Mathematics 198. SPRING, FALL. [3–3] McGuire & Umar.

228. Physics of Medical Imaging. Applications of physics to medicine, including signal analysis, image processing, atoms and light, x-rays, nuclear medicine, and magnetic resonance imaging. Prerequisite: one year of calculus. SPRING. [3] Price.

229a–229b. Electricity, Magnetism, and Electrodynamics. 229a: Electrostatic fields and potentials; Gauss's law; electrical properties of insulators, semiconductors and metals; the Lorenz force; magnetic fields and forces; electromagnetic induction, Maxwell's equations and electromagnetic waves. 229b: Electromagnetic waves in dielectrics and conductors; electromagnetic radiation in waveguide structures; relativistic electrodynamics; magnetism

as a relativistic phenomenon. Prerequisite for 229a: three semesters of calculus; corequisite for 229b: differential equations. [3–3] Albridge.

239a–239b. Advanced Physics Laboratory. Laboratory work in more advanced techniques or design and construction of new physics teaching experiments. Prerequisite: 225a-225b. [Variable credit: 1–3 each semester, variable total credit 3–6] Staff.

240a–240b. Selected Topics. [3–3]

243. Health Physics. Theory and instrumentation in health physics and radiological physics. Radiation shielding design, methods of external and internal dosimetry, and radiation regulatory issues. Prerequisite: 153 or 225a and one year of calculus. [3] Staff.

245. Computational Physics. Programming techniques in physics suitable for personal computers: classical scattering, one-dimensional barrier tunneling, Laplace's equation, static and time-dependent Schrödinger's equation, hydrodynamics, and diffusion. Recommended: Computer Science 120. FALL. [3] Umar.

248. Radiation Biophysics. Response of mammalian cells and systems to ionizing radiation. Acute radiation syndromes, carcinogenesis, genetic effects, and radiobiological basis of radiotherapy. Prerequisite: 226a and Biological Sciences 110a. [2] Freeman (Radiology and Radiological Sciences).

251a–251b. Introductory Quantum Mechanics. Wave-particle duality, indeterminacy, superposition, the Schrödinger equation, angular momentum and scattering, perturbation theory. Prerequisite: 225a and 227a. Recommended: Mathematics 2429. FALL. [3–3] Greene and Tolk.

254. Physics of Condensed Matter. Crystal structure and diffraction; phonons and lattice vibrations; free-electron theory of metals; elementary band theory of solids; semiconductors; optical properties of insulators; and applications to solid-state devices, magnetism, and superconductivity. Prerequisite: 223, 225a, and 227b. [3]

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: 251. [3] (Not currently offered)

256. 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. SPRING. [3] (Not currently offered)

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. SPRING. [3] Staff.

300a. Seminar. FALL. [1] Staff.

301a. Medical Physics Seminar. Radiotherapy treatment techniques and current methodologies in clinical therapy physics. Prerequisite: 226a. [1] Staff.

301b. Medical Physics Seminar. Topics in medical imaging, techniques and applications. Prerequisite: 226a. [1] Staff.

303. Experimental Nuclear Physics. Interactions of charged particles and photons in matter, coordinate transformations, statistics of nuclear processes, radiation detectors and analyzers, and selected topics in the design and application to experiments of particle accelerators and instrumentation used in nuclear and high energy physics. Recommended concomitant: 225b. [3] (Not currently offered)

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: 226a, 243 and differential equations. [3] Staff.

305. Particle and Continuum Mechanics. Least action principle, Lagrange formalism, conservation laws, two-body problem, small-amplitude vibrations, non-inertial reference frames, canonical formalism, rigid body motion, continuous media, and field theory. Includes programming on scientific work stations. Prerequisite; 227a and Math 261a; corequisite: Math 262a. FALL. [3] Oberacker.

306. Physical Methods for Investigating Nucleic Acid-Protein Interactions. A survey of biophysical techniques for investigating nucleic acid-protein interactions. Equal emphasis will be placed on the fundamental principles governing the experimental techniques and how these techniques are used to further our understanding of the structure, dynamics, and function of biological systems. Prerequisite: one year of calculus and one year of physics or consent of instructor. [3] Staff.

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: 226a and 304. [3] Coffey (Radiology and Radiological Sciences) and Duggan (Radiology and Radiological Sciences).

312. Clinical Therapy Physics II. Photon and electron beam algorithms for dosimetry calculations. Methodologies in three-dimensional treatment planning with specific applications to radiotherapy. Prerequisite: 311 and differential equations. [2] Duggan (Radiology and Radiological Sciences).

313. Clinical Diagnostic Physics. Instrumentation and application of physics to clinical diagnostic imaging procedures including; radiographic and fluoroscopic x-ray, CT, MRI, nuclear medicine, and ultrasound. Prerequisite: 226a, 226b, and 304. [3] Patton (Radiology and Radiological Sciences) and Pickens (Radiology and Radiological Sciences).

314. Laboratory in Clinical Therapy Physics. Applications of physics to clinical radiotherapy procedures, experience with equipment in a modern clinical radiotherapy environment, methodology and techniques for the verifications of simulated clinical procedures. Prerequisite: 226a and 311. [2] Coffey (Radiology and Radiological Sciences) and Duggan (Radiology and Radiological Sciences).

315. Laboratory in Clinical Diagnostics Physics. Applications of principles, techniques, and equipment used in radiographic and fluoroscopic x-ray, CT, MRI, nuclear medicine, and ultrasound imaging. Prerequisite: 226a, 226b, and 313. [2] Price (Radiology and Radiological Sciences) and Riddle (Radiology and Radiological Sciences).

329a–329b. Advanced Electrodynamics. 329a: Electrostatics, potentials, boundary value problems, multipole moments, polarization, magnetostatics, Maxwell's equations, electromagnetic wave propagation, dissipative and conductive media. 329b: covariant formulation, least-action principle and Lagrange density, energy momentum tensor, charges in external fields, radiation from accelerated changes, multipole radiation. Prerequisite: 229a–229b, Mathematics 262. [3–3] Brau.

330a–330b. Quantum Mechanics. Wave and matrix forms of the theory, transformation theory, theory of angular momentum, systems of indistinguishable particles, approximate methods of solution, energy levels and scattering processes, and introduction to relativistic quantum mechanics. Prerequisite: 251, Math 262. [3–3] Kephart and Duscher.

340a–340b. Nuclear and Heavy-Ion Theory. Phenomenological models (liquid drop, collective and shell models), nucleon-nucleon interaction, microscopic theories of nuclear structure (Hartree-Fock, RPA, interacting boson approximation), heavy-ion reactions below 20 MeV/A (TDHF theory), nuclear physics at intermediate and high energies (quarks in nuclei, quark-gluon plasma formation). Prerequisite: 330a. 340a, FALL; 340b not currently offered. [3–3] Oberacker.

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] Weiler.

350. Selected Topics in Theoretical Physics. Topics such as Lie groups and symmetry principles in quantum mechanics, quantum electrodynamics of strong fields, phenomenological models of nuclear structure. Prerequisite: consent of instructor. SPRING. [3] Pietronero.

351a–351b–351c–351d. Topics in the Physics of Elementary Particles. A single topic reflecting current faculty interest each semester. [1–1–1–1] (Not currently offered)

354a–354b. Condensed Matter Theory. Free-electron theory of metals; elementary band theory of solids; quantum theory of the harmonic crystal; elementary excitations; optical properties of materials; electronic basis of magnetic interactions; density-functional theory; relativistic band structure; electronic localization and amorphous solids; two-dimensional phase transitions and superlattices. Prerequisite: Physics 330 or consent of instructor. 354a: SPRING. [3–3] Diventra.

357a–357b. Atomic and Molecular Physics. Quantum mechanical treatment of atomic and molecular structure and dynamics, including binding, transitions, radiative transfer processes, and dynamics of elastic and inelastic scattering of electron-atom and atom-atom systems. Prerequisite: 330a–330b. SPRING. [3–3]

358b. Interaction of Light with Matter. Interaction of electromagnetic radiation with atoms, molecules, and solids. Optical pumping, rate equation treatment of laser action; nonlinear interactions of light with matter, including multiphoton processes, harmonic generation and stimulated scattering; and the behavior of atoms and molecules in intense photon fields. FALL. [3] Staff.

359a–359b. Surface Structure and Dynamics. 359a: Geometrical and electronic structure of surfaces, including surface reconstruction, density of states, and effects of adsorbates, impurities and electronic defects. 359b: Interaction of ions, atoms and metastable atoms with surfaces; classical sputtering theory, desorption induced by electronic transitions; and inelastic interactions of photons, electrons, and heavy particles with surfaces. Prerequisite: 330a–330b. [3–3] Itoh.

360a–360b. General Relativity and Cosmology. Einstein's geometric theory of gravity in terms of tensor analysis and differential geometry. Einstein's field equations are derived and solutions are discussed. Applications of general relativity are explored, including those to very strong gravitational fields, gravitational collapse, neutron stars, black holes, and quantum gravity. Topics in cosmology will include red shifts and cosmic distance relations, big bang cosmology, primordial nucleosynthesis, the very early universe and inflationary cosmologies. Prerequisite: Consent of instructor. [3–3]

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]

369. Master's Thesis Research.

370a–370b. 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 Rabelian gauge theories. Prerequisite: 305, 329a–329b, 330a–330b. [3–3] Weiler and Kephart.

390a–390b. Independent Study. [Variable credit, 1–3 each semester]

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] Staff.

391b. Medical Physics Practicum: Diagnostic . Diagnostic physics in a clinical setting. Instrumentation methodology, calibration, quality assurance. Diagnostic radiology patient interaction, clinical conference attendance, and review of imaging techniques in radiology. Prerequisite: 313 and 315. [6] Staff.

399. Ph.D. Dissertation Research.

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

Astronomy

222. Observational Astronomy. Principles and techniques of observational astronomy including astrometry, photographic and photoelectric photometry, spectral classification, and radial velocity measurements. Evening sessions at the Dyer Observatory will be scheduled. Prerequisite: 102 or 175; Physics 225a. FALL. [3] Heiser

223. Binary Stars. Visual, eclipsing, and spectroscopic binaries; techniques for solving their orbits. Extended atmospheres, circumstellar matter, mass transfer, x-ray and radio emission, and orbital period changes in binaries. Evolution of close binaries. Prerequisite: 102 or 175. [3] (Not currently offered)

252. Stellar Astrophysics. Absorption and emission of radiation by the sun and stars. Principles of stellar structure and stellar evolution from formation to death. Prerequisite: Physics 223 and 225a; Mathematics 198. [3] (Not currently offered)

253. Galactic Astrophysics. Interstellar matter and gaseous nebulae, the structure and evolution of normal galaxies, active galactic nuclei and quasars, and observational cosmology. Prerequisite: 175, Physics 225a; Mathematics 198. SPRING. [3] Heiser.

300a–300b. Astronomy Seminar. [1–1] Staff.

307a–307c–307d. Selected Topics in Astrophysics. Stellar atmospheres, stellar interiors, interstellar matter, binaries, variable stars, solar system physics, and galaxies. Prerequisite: consent of instructor. 307a, 307d FALL; 307c SPRING. [3–3–3] Staff.

369. Master's Thesis Research.

Political Science

CHAIR James Lee Ray
DIRECTOR OF GRADUATE STUDIES John G. Geer
PROFESSORS EMERITI Alex M. Dragnich, William C. Havard, Jr., Avery Leiserson,
    Harry Howe Ransom, Benjamin Walter
PROFESSORS Donna L. Bahry, Robert H. Birkby, William James Booth, John G. Geer,
    George J. Graham, Jr., Hugh Davis Graham, Larry J. Griffin, M. Donald Hancock,
    Erwin C. Hargrove, Bruce I. Oppenheimer, James Lee Ray, Carol M. Swain,
    John A. Vasquez
RESEARCH PROFESSOR Trudi C. Miller
ASSOCIATE PROFESSORS Wendy A. Hunter, Richard A. Pride, Derek J. Waller,
    Kurt Weyland
ASSISTANT PROFESSORS Katherine Barbieri, Geoffrey C. Layman,
    Bradley L. Palmquist, Andrew Sabl
RESEARCH ASSISTANT PROFESSOR Marie T. Henehan
SENIOR RESEARCH ASSOCIATE Jean Bethke-Elshtain
INSTRUCTOR Richard M. Tucker

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

❧ THE master's degree in political science may be earned through (a) a
program that requires 24 hours of course work and a thesis or (b) a non-
thesis option requiring 33 hours of course work (including political sci-
ence 350 and 351 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. Statistics for Political Research (350), required of all prospective
candidates, is 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.

202. Classical Political Philosophy. Intensive analysis of the principal political philoso-
phers in the classical tradition. SPRING. [3] Booth. (Offered 2000/01)

203. Modern Political Philosophy. Intensive analysis of the principal political philosophers
in the modern tradition. FALL. [3]

204. American Political Thought. An analytical study of American political theories and
their impact upon our political institutions. [3] Birkby. (Not currently offered)

205. Modern Political Ideologies. Analysis of the belief systems of selected political move-
ments, groups, and societies; their relationship to political philosophy; and theories of polit-
ical action. SPRING. [3] Sabl.

206. Foundations of Marxism. Intensive analysis of the political, philosophical, and eco-
nomic theories of Karl Marx in the context of European philosophical and political traditions.
Major critical interpretations of Marx will be stressed. FALL. [3] Graham.

207. Liberalism and Its Critics. Philosophical and political analysis of the utilitarianism of Mill and Bentham and the liberalism of Locke and Kant. Critiques by contemporary Libertarians and Communitarians. SPRING. [3] (Offered 2000/01)

209. Issues in Political Theory. Topics vary from semester to semester. May be repeated once if there is no overlap with previous offerings. Prerequisite: 202, 203, 205, or 206. [3] (Not currently offered)

210. West European Politics. Analysis of political development, social forces, institutions, and public policy in Great Britain, France, West Germany, Italy, and Sweden. FALL. [3] Hancock.

211. The European Union. Political and economic integration. Origins, institutions, decision processes, policies, achievements, and prospects of the European integration movement. SPRING. [3] Hancock.

212. Politics in Russia and Successor States. Government, politics, and system performance in the Soviet Union and contemporary Russia, with some reference to other East European countries. SPRING. [3] Bahry.

213. Democratization and Political Development. Comparative study of political development, with a focus on institutions. The effect of political choices about voting systems, executive and legislative powers, cabinet formation, and other institutions on political competition, parties and government stability. Cases from established democracies and countries undergoing democratization. No credit for students who have taken 317. SPRING. [3] Bahry. (Offered 2000/01)

214. The Japanese Political System. Study of the government and politics of Japan, in the context of the interaction of traditional and modern elements in contemporary Japanese political style. FALL. [3] Waller.

215. Change in Developing Countries. Comparative study of political and economic change in developing countries. Political implications of ethnicity, economic dependency, and environmental degradation. SPRING. [3] Hunter.(Offered 2000/01)

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. SPRING. [3] Waller.

217. Latin American Politics. Crossnational analysis of political institutions, cultures, and processes of change in Latin America. FALL. [3] Hunter.

218. Social Reform and Revolution. Reform and revolution as responses to social inequality. Causes and outcomes of reform and revolution in Europe and Latin America from the mid–nineteenth century to the present. SPRING. [3] Weyland. (Offered 2000/01)

219. African Politics. Domestic politics and foreign relations of African states in comparative perspective. How African history has been studied and the tools political scientists have developed to study Africa. Colonialism, the colonial legacy, independence movements on the continent, contemporary issues and problems in selected countries (e.g., Ivory Coast, Kenya, Tanzania). SPRING. [3] Henehan. (Offered 2000/01)

220. Crisis Diplomacy. Analysis of foreign policy decision making and strategy. Emphasis on differences between crises that lead to war and those that do not. Foreign relations of Britain, France, Germany, Russia, and Japan. FALL. [3] Vasquez.

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. SPRING. [3] Tucker.

222. American Foreign Policy. Critical analysis of major international and domestic factors shaping U.S.foreign relations as reflected in selected twentieth-century experiences. FALL. [3] Vasquez.

223. The Making of U.S. Foreign Policy. Institutions and domestic politics: Congress, the President, the military, the bureaucracy, the media, political parties, interest groups, and public opinion. Decision-making theory, general theories of foreign policy, conceptual tools for analyzing foreign policy. SPRING. [3] Henehan

224. Theories of World Politics. Analysis of major theories of the basic factors underlying global relations. [3] Ray. (Not currently offered)

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. SPRING. [3] Barbieri. (Offered 2000/01)

226. International Law and Organization. The role of international law and international organizations in the contemporary global political system. Focus on the evolution and impact of international law as well as such organizations as the United Nations, the International Monetary Fund (IMF), and selected regional (as well as nongovernmental) organizations. FALL. [3] Ray. (Offered 2000/01)

227. Economics and Foreign Policy. Economic factors influencing foreign policy behavior, including economic factors, conditions, and motivations for conflictual and cooperative relations. Economic instruments used by governments to achieve policy goals: trade ties, economic sanctions, foreign aid. Economic theories of war and peace. FALL. [3] Barbieri.

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. FALL. [3] Weyland. (Offered 2000/01)

231. Contemporary Issues in Europe. Detailed analysis of the political, economic, and social issues facing Europe's post–Cold War period including regional integration, transitions to democracy, economic transformation, ethnic-national relations, industrial organization, environmental politics. [3] (Not currently offered)

232. Evolution in French Foreign Policy Under the Fifth Republic. Development of distinct French foreign policy; use of colonial experience in the North-South dialogue; France's place in the new international order. Offered in Vanderbilt-in-France. SPRING. [3] Pelopidas.

233. Social Movements in the Developed and Developing Worlds. Comparative study of protest movements with emphasis on origins, activities, and impact of movements focusing on women, ethnic minorities, and the environment. SPRING. [3] Hunter. (Offered 2000/01)

234. Women, Politics, and the Development of the Third World. Analysis of the special problems afflicting women in the developing world and examination of proposed strategies, domestic and international, for reform. SPRING. [3] Hunter. (Offered 2000/01)

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. SPRING. [3] Oppenheimer.

241. American Public Opinion and Voting Behavior. The development and dynamics of political opinion and its effects on voting and public policy. Models of political behavior. SPRING. [3] Layman. (Offered 2000/01)

242. Political Communication. The relationship of government and the press. Theories of communication; mass media and sociopolitical change; political persuasion and propaganda; responsibilities of the press. SPRING. [3] Pride.

243. Political Campaigns and the Electoral Process. Theories of representation and democratic accountability; electoral strategies and tactics, including political polling and analysis. FALL. [3] Pride.

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. FALL. [3] Oppenheimer.

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. SPRING. [3] Geer. (Offered 2000/01)

247. American Political Culture. (Also listed as American Studies 247) 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. SPRING. [3] Pride.

251. Regulations and Subsidies. Theoretical and empirical analyses of government activity. Governmental decisions affecting prices; pollution and other externalities; consumer protection; social insurance and agricultural subsidies. Political processes and policy outcomes. FALL. [3] Walter.

253. Ethics and Public Policy. Ethical argument in the public policy process; major approaches to ethics applied to specific issues of public policy. [3] (Not currently offered)

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. FALL. [3] Walter.

261. Constitutional Interpretation. The nature and sources of constitutional law; judicial development of principles of distribution and scope of governmental powers; constitutional limitations and personal rights. Case method. FALL. [3] Birkby.

262. The Judicial Process. Functioning of the judiciary in the American political process; operation and powers of the courts; nonlegal aspects of the judicial process; political role and effects of judicial decisions. Prerequisite: 261 recommended but not required. SPRING. [3] Birkby. (Not currently offered)

270. Conducting Political Research. Introduction to research sources, designs, and methods used by political scientists. Emphasis will be placed on locating and accessing data, the logic of causal inferences, and basic data presentation and analysis. SPRING. [3] Ray.

300. Political Theory. Basic course in political theory. Surveys majors texts in political theory, as well as central concepts and debates in the current literature. SPRING. [3] Sabl. (Offered 2000/01)

302. Democratic Theory. Growth of democratic theory in political philosophy and historical application. Connections between democratic theory and political institutions. [3] (Not currently offered)

305. Philosophical Foundations of Politics. The major philosophical modes underlying the political theories of the twentieth century and their main exponents, including positivism, pragmatism, philosophical idealism, and transcendentalism, as exemplified by Arnold Brecht, John Dewey, Michael Oakeshott, Hannah Arendt, Leo Strauss, and Eric Voegelin. [3] (Not currently offered)

306. Problems of Interpretation in Political Theory. Major interpretive problems of political theory. Emphasis on philosophical assumptions, meaning, text, and context. May be repeated for credit if topics vary sufficiently. [3] (Not currently offered)

307. Introduction to Formal Theory and Modeling. Basic concepts of 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. The importance of rules in decision making, manipulability of outcomes, bargaining strategies and the evolution of cooperation. FALL. [3] Tucker.

308. Studies in Historical Political Thought. Major texts and themes focusing on a single thinker, a school of thought, or a theme. May be repeated with different topics. SPRING. [3] Booth.

309. Research in Political Theory. Supervised individual research and reading on selected topics in political theory. FALL, SPRING. [3] Staff.

310. Studies in Comparative Analysis. A survey of important literature and concepts in the field of comparative politics. SPRING. [3] Bahry.

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. SPRING. [3] Hancock. (Offered 2000/01)

313. Politics in Russian and Successor States. Selected features of post–1989 changes in the Russian governmental system. [3] (Not currently offered)

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. FALL. [3] Hunter.

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." SPRING. [3] Weyland. (Offered 2000/01)

317. Political Development and Democratization. Impact of institutions on political development. Effects of alternative systems of elections, executive and legislative authority, and representation. Impacts on democratic transitions and on political stability. No credit for students who have taken 213. FALL. [3] Bahry. (Offered 2000/01)

319. Research in Comparative Analysis. Supervised individual research and reading on selected topics in comparative politics. FALL, SPRING. [3] Staff.

320. International Politics. Basic course in international politics. Surveys major subfields, focusing on concepts and theories that orient research—e.g., balance of power, interdependence, imperialism, decision-making, crisis-behavior. FALL. [3] Ray.

321. International Conflict: Theories and Methods. Analysis of international conflict and war. FALL. [3] Vasquez. (Offered 2000/01)

322. Peace Research. Alliances, crisis escalation, territorial disputes, and characteristics of peaceful systems. SPRING. [3] Vasquez. (Offered 2000/01)

323. Current Theory and Research in World Politics. Recent trends in theory construction, research design, and findings. [3] (Not currently offered)

325. International Political Economy. Patterns of conflict and cooperation in the world economy. Theories of world systems, dependency, neoclassicism, regimes, and public choices, their applicability to trade, money, debt, industrial organization, economic development, regional integration. SPRING. [3] Barbieri. (Offered 2000/01)

326. The Political Economy of War and Peace. Economic theories of war and peace, including economic actors, conditions, and motivations believed to contribute to conflict and cooperation between nations. "Economic statecraft" will also be covered. SPRING. [3] Barbieri.

327. Domestic Politics and International Interactions. Impact of domestic political structures and processes on foreign policies and international politics. Extent to which factors external to states in their international environment affect domestic politics. [3] Ray. (Not currently offered)

329. Research in International Politics. Supervised individual research and reading on selected topics in international politics. FALL, SPRING. [3] Staff.

330. Studies in American Politics. A survey of important literature and concepts in the field of American politics. FALL. [3] Oppenheimer. (Offered 2000/01)

331. Party Politics. Structure and functions of political parties; theories of partisan change, party formation, and party organization. Influence on rules and the behavior of politicians on party policies. SPRING. [3] Geer.

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. SPRING. [3] Lagman. (Offered 2000/01)

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. SPRING. [3] Pride. (Offered 2000/01)

334. Executive Institutions. Theories of decision making and implementation in executive institutions. Application of theory to the executive institutions of American government, including the presidency, cabinet departments, and agencies. The relationships of elected politicians, political appointees, and civil servants in executive institutions. [3] Hargrove. (Not currently offered)

335. Politics of American Legislation. The structure and function of American legislative institutions, especially Congress, and their relation to the wider setting. FALL. [3] Oppenheimer.

336. The Judicial Process. The role of the judiciary in the American political process; operation, staffing, and powers of the courts; political role and effects of judicial decisions; policy-making by the courts. [3] Birkby. (Not currently offered)

339. Research in American Politics. Supervised individual research and reading on selected topics in American politics. FALL, SPRING. [3] Staff.

350. Statistics for Political Research. Introduction to statistical analysis with applications in political science, statistical distributions, statistical inference, bivariate and multiple regression. SPRING. [3] Tucker.

351. Techniques of Political Research. Research design and analysis. Interpretation with quantitative and qualitative approaches. Survey design and analysis, roll-call analysis, and content analysis. Emphasis on concept formation and measurement. FALL. [3] Geer.

352. Advanced Statistics. Advanced topics in statistical analysis with research applications in maximum likelihood estimation, logit and probit analysis, simultaneous equation models, generalized least squares, and introductory time series concepts. FALL. [3] Palmquist.

369. Master's Thesis Research. [0]

370. Topics in Political Science. An inquiry into selected topics. May be repeated for credit when topics vary. Consult *Schedule of Courses* for offerings. [3]

390a–390b. Independent Study. FALL, SPRING. [Variable credit: 1–3 each semester]

398. Dissertation Seminar. Focus on developing the theoretical, empirical, and normative aspects of each student's dissertation research. FALL. [3] (Not currently offered)

399. Ph.D. Dissertation Research.

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

Psychology

CHAIR Timothy P. McNamara
DIRECTOR OF GRADUATE STUDIES Jeffery J. Franks
DIRECTOR OF CLINICAL TRAINING Andrew J. Tomarken
PROFESSORS EMERITI Richard L. Blanton, Keith N. Clayton, Martin Katahn,
    Leslie Phillips, Hans H. Strupp, Leland E. Thune, Warren W. Webb
PROFESSORS Randolph Blake, John D. Bransford, Thomas G. Burish,
    Vivien A. Casagrande, William F. Caul, Keith N. Clayton, Ford F. Ebner, Robert Fox,
    Jeffery J. Franks, Susan R. Goldman, Steven D. Hollon, Jon H. Kaas, Joseph S. Lappin,
    Timothy P. McNamara, Richard D. Odom, James W. Pellegrino, Oakley S. Ray,
    Jeffrey D. Schall, William P. Smith, Travis I. Thompson, Kenneth A. Wallston
ASSOCIATE PROFESSORS Robert J. Barrett, Judy Garber, Joseph D. LaBarbera, Laura R.
    Novick, David G. Schlundt, Andrew J. Tomarken, Lynn S. Walker
ASSISTANT PROFESSORS Daniel H. Ashmead, Jo-Anne Bachorowski, Isabel Gauthier,
    Robert Gray Bobbitt, Denise Davis, Thomas J. Palmeri, René Marois, Mitchell Schwaber
RESEARCH ASSISTANT PROFESSORS Kenneth C. Catania, Sherre L. Florence,
    Neeraj Jain, Hans Peter Meltzer, Iwona Stepniewska, Kirk G. Thompson
SENIOR LECTURER Leslie M. Smith

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

❧ THE program offers doctoral (Ph.D.) study for students who intend to become psychological scientists or scientist-practitioners. Students who plan to terminate their studies with the master's degree are not encouraged to apply. Theory, method, and research experience in a number of areas of psychological science are emphasized. Course requirements are organized into the three broad areas of cognitive science, neuroscience, and clinical science. Students have intensive research training with individual faculty in the areas of clinical psychology, cognition, development, learning, perception, psychobiology, sensory neurophysiology, and social psychology. Students in the area of clinical psychology are also provided with extensive training in clinical skills. Admission is not limited to students with undergraduate backgrounds in psychology.

201. Neuroscience. A comprehensive introduction to the field of neuroscience from important molecules to cell function to neural systems to cognition. Topics include the physiology of nerve cells, the sensory systems of vision, audition and touch, the motor system, sleep, consciousness, speech and sexual behavior. Coverage of clinical topics includes the chemical basis of the psychoses, diseases of the brain, and repair mechanisms after brain injury. FALL, SPRING. [3] L. Smith.

208. Principles of Experimental Design. An introduction to theory and research methods in psychological science. Topics include philosophy of science, ethical issues, experimental design, and data interpretation. Not open to students who have received credit for Psychology 213. FALL, SPRING. [3] Palmeri, Bost

209. Quantitative Methods. Introductory survey of principles and methods for the statistical analysis of experiments, with emphasis on applications in psychology. Major topics are descriptive and inferential statistics. Prerequisite: 208. FALL, SPRING. [3] Franks.

211. Personality. Introduction to the study of personality. Major theories of personality development, methods of assessment, and results of research. The study of normal behavior is emphasized. [3] (Not currently offered)

214. Perception. Current theory and research in sensation and perception, including an analysis of philosophical and biological issues. Understanding how biological organisms acquire, process, and use information about objects and events in the environment. Vision, audition, taste, smell, and touch. FALL, SPRING. [3] Fox, Lappin.

215. Abnormal Psychology. Introduction to the study of deviant behavior. Topics include definitions of adequate human functioning, processes that disrupt functioning, and methods of evaluation and treatment. No credit for students who have taken 115a Section 2 (Abnormal Psychology). FALL. [3] Bachorowski, Hollon.

216. Movement. Psychological, computational, and neural perspectives on the activities of looking, reaching, grasping, speaking, smiling or frowning, walking and running. [3] (Not currently offered)

221. Developmental Psychology. Developmental changes and continuity in psychological processes from the prenatal period through old age. Social, perceptual, cognitive, linguistic, and emotional development. When 221 is not offered, students may substitute Peabody Psychology and Human Development 1630, (Developmental Psychology). [3] (Not currently offered)

222. Learning and Memory. An analysis of the major theories and research results related to learning and memory. [3] (Not currently offered)

225. Thinking and Cognition. Introduction to cognitive psychology. Topics include attention, pattern recognition, knowledge representation, language, reasoning, and human intelligence. FALL. [3] Bost.

231. Social Psychology. The influence of social conditions upon behavior in interpersonal and group relations; perception, judgment, learning, and attitudes. FALL. [3] W. Smith.

234. Laboratory in Behavioral Neuroscience. Lectures and accompanying experiments to demonstrate basic neural and endocrine regulation of behavior. Prerequisite: 201. FALL. [3] Schall.

235. Biological Basis of Mental Disorders. Recent discoveries of brain changes that alter mental functioning. How a malfunctioning brain can produce suicidal behavior, mood and anxiety disorders, schizophrenia, alcoholism, and sexual dysfunction. How drug abuse results in altered brain chemistry and how organic brain diseases such as epilepsy, AIDS, or stroke can cause cognitive impairment. Not open to students who have completed 115a, Section 7 (Biological Basis of Mental Disorders). SPRING. [3] L. Smith.

240. Cognition, Consciousness, and Self. Perspectives from Buddhist psychology, cognitive, physical, and biological science. FALL. [3] Franks.

242. Psychology of Language. Introduction to psycholinguistics. Topics include the structure of languages, perception of speech, syntactic processing, comprehension, production of speech, acquisition of language by children, hemispheric lateralization, aphasia, and communication by animals. Prerequisite: 222 or 225. FALL. [3] (Not currently offered)

245. Emotion. Introduction to the study of emotion. Topics include defining emotion, functions of emotion, emotion and health, emotion and psychopathology, individual differences, and emotional development. Repeat credit for students who have taken 288: Emotional Processes. [3] (Not currently offered)

250. Control of Human Behavior. Factors determining the behavior of human groups and individuals. Emphasis on research on the effectiveness of methods such as psychotherapy, programmed learning, brainwashing, teaching, and propaganda procedures. Attention to applications as well as to theoretical bases of the methods. Ethical and moral issues relating to the control of human behavior. SPRING. [3] Ray.

252. Human Sexuality. The physiological, psychological, and cultural bases of sexual behavior. History of sexuality, gender roles, sex in human relationships, diagnosis and treatment of sexual disorders and dysfunctions, crosscultural perspectives, pornography, rape, AIDS, and homosexuality. FALL. [3] L. Smith.

253. Laboratory in Cognition. Applications of experimental methods to the study of human cognition. Attention, short-term memory, long-term memory, implicit memory, knowledge representation. Prerequisite: 208, 209, and either 222, 225, or 278. [3] (Not currently offered)

254. Laboratory in Perception. Applications of experimental methods to the study of human perception. Psychophysical techniques, signal detection theory, direct and indirect scaling, chronometric analyses. Prerequisite: 208, 209, and 214. [3] (Not currently offered)

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. [3] (Not currently offered)

259. Neural Network Models of Cognition. Computational models composed of many simple units working in parallel. Models of complex cognitive functions such as object recognition, concept formation, and language, as well as their capabilities and limitations. Computer simulations of neural networks. Prerequisite: 101, 115, Philosophy 100, or Computer Science 100. [3] (Not currently offered)

261. Drugs and Behavior. The field of psychoactive drugs is surveyed, with particular emphasis on the behavioral effects of these agents. SPRING. [3] Ray.

265. Introduction to Psychological Assessment. Issues and strategies surrounding the psychological tests most commonly used in psychology, education, and business. Topics include testing of intelligence, measures of personality and psychopathology, assessment of abilities and aptitudes. [3] (Not currently offered)

266. Interpersonal and Intergroup Relations. (Also listed as Sociology 262) An examination of social psychological literature related to intergroup and interpersonal conflict and its resolution, with special attention to problems of relations between black and white in contemporary society. SPRING. [3] W. Smith.

269a–269b. Developmental Neuroscience and Psychobiology. 269a: Normal and abnormal brain development. Cell division, migration, cell death, synapse formation, plasticity, and clinical syndromes. 269b: Description, causes, and consequences of disorders in neurobehavioral development. The nature of developmental disabilities, their prevention, and management of disabling conditions. Prerequisite: 233. [3–3] Ebner, Thompson.

272. Structure and Function of the Cerebral Cortex. Classic and current concepts of cerebral function. Species differences, receptive field organization, neurotransmitters, modifications by experience, and behavioral effects. Prerequisite: 201. [3] (Not currently offered)

274. Mammalian Neuroanatomy. Structure of the mammalian brain, including functional connections. Prerequisite: 201. [3] (Not currently offered)

276. Categories and Concepts. Categorization and conceptual thought processes examined from perspectives of cognitive psychology, developmental psychology, linguistics, anthropology, philosophy, and neuroscience. SPRING. [3] Palmeri.

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. [3] (Not currently offered)

278. Cognitive Science. Interaction of cognitive psychology, artificial intelligence, neuroscience, and linguistics in explaining knowledge, perception, memory, and learning. Philosophical questions that arise in trying to understand the mind. Prerequisite: 101 or 115, Philosophy 100 or Computer Science 100. [3] (Not currently offered)

279. The Chemistry of the Brain. Current theory and the application of biochemical approaches to the study of neurotransmitters, neuromodulators, and drug actions in the nervous system. Prerequisite: 233. [3] (Not currently offered)

The following courses are seminars devoted to intensive study of special topics.

280. Special Topics in Perception. [3] (Not currently offered)

281. Special Topics in Learning. [3] (Not currently offered)

282. Special Topics in Cognitive Psychology. [3] (Not currently offered)

283. Special Topics in Developmental Psychology. FALL. [3] Odom.

284. Special Topics in Comparative Psychology. [3] (Not currently offered)

285. Special Topics in Physiological Psychology. SPRING. [3] Caul.

286. Special Topics in Human Competence. [3] (Not currently offered)

288. Special Topics in Clinical Psychology. FALL. [3] Bachorowski.

289. Special Topics in Social Psychology. SPRING. [3] W. Smith.

300a–300b. Research Seminar. 300a: Research methodology in psychology and the design of individual research projects. 300b: Completion of the project. Concurrently with group discussion, the student follows a tutorial research relation with a staff member and completes the project. Designed to match each student's background and academic interests. [Variable credit: 1–4 each semester]

301a–301b. Advanced General Psychology. Physiological psychology, perception and sensation, learning, complex processes, developmental, personality, social psychology, and psychopathology. Participation in various sections determined by each student's background and career interests. [3–3] Staff.

302. History and Systems of Psychology. Modern psychology viewed in the perspective of problems and theories of the past. Emphasis on major concepts, problem areas, developing methodology, and "schools" from which much of modern psychology has evolved. [3] (Not currently offered)

303. Models of Human Memory. Survey of contemporary models of human memory, especially formal models. Methods of fitting models to data will be discussed. Prerequisite: graduate course on cognition. SPRING. [3] McNamara.

304a–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, descriptive and inferential statistics, and introduction to multivariate analysis. [3–3] Tomarken.

306. Evolutionary Psychology. Interdisciplinary analysis of the origins of mind, with particular emphasis on the mind/brain as a product of biological evolution. [3] (Not currently offered)

307. Group Process and Structure. Social psychological theory relating to phenomena of social interaction; methodological and substantive problems in selected areas of research, such as group problem-solving, and interpersonal bargaining. [3] (Not currently offered)

309. Factor Analysis and Structural Equation Modeling. Multivariate analysis with latent variables. After coverage of exploratory factor analysis, various applications of structural equation modeling (SEM) are discussed, including confirmatory factor analysis, path analysis, causal modeling with latent variables, latent growth curve and panel models, multiple-group and multiple-level models, and the treatment of missing data. Principles of identification, estimation, and goodness of fit are emphasized. Students gain hands-on experience with SEM software. FALL. [3] Tomarken.

310. Clinical Research. Basic methodologies used in clinical research and treatment evaluation, including general strategies for research, techniques of assessment, methods in evaluation, and unique research problems associated with special populations. Ethical considerations. [3] (Not currently offered)

311. Measurement Theory in Psychology. Methodological and mathematical issues in the measurement of psychological attributes: scaling models, psychophysical methods, reliability and validity of measurements, multivariate analysis, and special problems of measurement in research. Prerequisite: 304ab or equivalent. [3] (Not currently offered)

Courses 312, 314, 315, 323, and 324 are limited to psychology Ph.D. students.

312. Psychological Assessment. Major techniques of psychological assessment, with emphasis on rationale, range of applicability, administration, and scoring. Reading, class demonstration, and individual supervision of practical experience. [3] (Not currently offered)

314. Theories of Psychotherapy I. Analysis of the major theories of psychotherapy and their evaluation in the light of experimental and clinical research. Experience in supervised clinical settings or observation of clinical sessions is provided to further understanding of psychotherapeutic processes. [3] (Not currently offered)

315. Theories of Psychotherapy II. 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. SPRING. [3] Hollon.

320. Advanced Research Seminar. Concurrently with group discussion, each student will plan a master's level research project and work in a tutorial relationship with a member of the faculty. Each student must complete an acceptable project proposal and collect at least part of the experimental data. The project will be completed during the following spring semester to satisfy the requirement of a master's level project. FALL, SPRING. [2] Staff.

323. Practicum in Psychological Assessment. FALL, SPRING. [Variable credit: 1–5 each semester] Staff.

324. Practicum in Psychotherapy. FALL, SPRING. [Variable credit: 1–5 each semester] Staff.

331a–331b. Advanced Investigational Techniques. A non-thesis research project. Should be registered for only after consultation with the staff member who will be supervising the work. [Variable credit: 1–3 each semester] Staff.

335. Special Topics in Neuroscience. (Also listed as Cell Biology 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 Biology). Prerequisite: Cell Biology 323 or equivalent course. FALL. [2] Casagrande.

336. The Visual System. (Also listed as Electrical and Computer Engineering 351, Neuroscience 347, and Cell Biology 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 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] Bonds. (Electrical Engineering), Casagrande (Cell Biology).

The following graduate seminars, 341–355, may be repeated up to four times each.

341. Seminar: Developmental. [3] (Not currently offered)

342. Seminar: Social. [3] (Not currently offered)

343. Seminar: Perception. SPRING. [3] Fox.

344. Seminar: Physiological. FALL. [3] Blake.

351. Seminar: Cognitive Psychology. FALL. [3] Palmeri.

352. Seminar: Clinical Psychology. FALL. [3] Hollon.

353. Seminar: Ethics and Cultural Diversity. [3] (Not currently offered)

354a. Clinical Neuropsychology. Introduction to brain-behavior relationships from a clinical perspective. Cognitive, behavioral, and emotional syndromes that follow injury to the adult central nervous system are reviewed. Topics include disorders of language, perception, memory, general intelligence, and motor behavior. Prerequisite: permission of instructor. [3] (Not currently offered)

354b. Neuropsychological Assessment. Techniques and issues relevant to the clinical assessment of adults with brain damage. Prerequisite: Psychology 312, 354a, and permission of instructor. [3] (Not currently offered)

355. Seminar: Advanced Psychological Assessment. Major techniques of psychological assessment with emphasis on clinical and methodological issues; interpreting, organizing and reporting findings; intensive case studies. Prerequisite: 312. [3] (Not currently offered)

356. Seminar: Clinical Psychopharmacology. Psychopharmacologic treatment for various psychiatric patient groups. Topics include: physiological mechanisms of drug actions; the major classes of psychotherapeutic drugs, and how, when, and why they are prescribed, as well as their side effects and effectiveness; patient compliance; the relationship between psychotherapy and pharmacotherapy; and recognition and treatment of alcohol and substance abuse in psychiatric patients. [3] (Not currently offered)

357. Seminar in Cognitive Science. Integration of the subareas of cognitive science. FALL, SPRING. [2] Staff. May be repeated up to four times.

358. Seminar in Neuroscience. Integration of the subareas of neuroscience. FALL, SPRING. [2] Staff. May be repeated up to four times.

360. Seminar in Clinical Science. Integration of the subareas of clinical science. Includes history and systems of psychology as related to clinical science, ethical issues, and problems encountered in professional psychology. FALL, SPRING. [2] Staff. May be repeated up to four times.

361. Interdisciplinary Seminar in Social Psychology. Integration of the disciplinary subareas of social psychology. May be repeated up to four times. FALL, SPRING. [1–2] W. Smith.

369. Master's Thesis Research. [0]

399. Ph.D. Dissertation Research.

Psychology and Human Development

CHAIR John J. Rieser
DIRECTOR OF GRADUATE STUDIES David Lubinski
PROFESSORS Alfred A. Baumeister, Camilla P. Benbow, Leonard Bickman,
    John D. Bransford, Penelope H. Brooks, David S. Cordray, Paul R. Dokecki,
    Judy Garber, Susan R. Goldman, James H. Hogge, Steven D. Hollon, Ann P. Kaiser,
    Mark Lipsey, John R. Newbrough, James W. Pellegrino, John J. Rieser,
    Howard M. Sandler, Travis I. Thompson, Tedra Ann Walden, Steven F. Warren
PROFESSORS OF THE PRACTICE Vera A. Stevens Chatman, Sharon L. Shields

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

❧ THE graduate programs in psychology and human development emphasize basic research as well as empirical, data-based approaches to practical problems in education and human development. There is particular concern with the discovery of new ways to bring psychological knowledge and research skills to bear on societal problems, especially those amenable to intervention during the early years of life.

Major in Psychology and Human Development

Department	*Area of Specialization*
Psychology and Human Development	General Psychology *(M.S. only)*
	Clinical Psychology
	Cognitive Studies
	Community Psychology
	Developmental Psychology
	Quantitative Methods

For the Ph.D., areas of specialization include clinical psychology, cognitive studies, community psychology, developmental psychology, and quantitative methods. Students may take a master's degree as part of their doctoral program. The department also provides training in general psychology at the master's degree level. A thesis is required for all master's degrees.

Specific guidelines and requirements beyond general departmental regulations are set by training committees in each area of specialization.

210P. Introduction to Statistical Analysis. Selection, application, and interpretation of measures of relative frequency, location, dispersion, and association. Approaches to statistical inference. Not open for credit to graduate students in psychology. FALL, SUMMER. [3]

211P. Statistical Analysis. Second course in statistics for upper division undergraduates and students in education, counseling, special education, and related social and behavioral sciences. One-factor and multifactor analysis of variance designs with both between-groups and within-groups factors, goodness of fit and contingency analysis, measures of general and linear regression. Inferences concerning means, variances, proportions, and correlations. [3]

289P. Ethics for Human Development Professionals. Normative evaluation of ethical issues in serving human need. Conflicting values within moral dilemmas will be examined from a variety of theoretical perspectives and practical criteria. Case studies of moral issues confronting the individual, the family, service organizations, and the general public will be reviewed. FALL, SPRING. [3] Dokecki.

300P. History and Systems of Psychology. Historical study of the philosophical and scientific foundations of contemporary psychology. Required of all Ph.D. and M.S. students in psychology. FALL. [3] Plas.

301P. Methods of Psychological Research. Methods for collecting and analyzing empirical information about behavior. Required of first-year graduate students in psychology and human development. Serves as a base upon which to build research competence through more advanced courses and research apprenticeships. FALL. [3] Novick.

302P. Psychology Proseminar. Surveys of major sub-topics in psychology (e.g., developmental psychology, cognition, individual differences, biological bases). (Not currently offered)

303P. Research Methods in Developmental Psychology. Major empirical approaches to the study of development. Emphasis on human behavioral development, although elements from comparative psychology and biomedical sciences included. Intended primarily for doctoral students in psychology with an emphasis on human development. [3] (Not currently offered)

304P. Field Research Methods. The purpose of this course is to provide the student with an introduction to applied social research in field settings. The course will provide the student with an understanding of basic issues in measurement and design as well as practical skills needed to conduct research in real world settings. Basic knowledge of statistics suggested. FALL. [3] Pion.

305P. Research Methods in Child Clinical Psychology. Research with clinical populations with a particular emphasis on methods applied to the study of children, youth, and families. SPRING. [3] Garber.

310P. Statistical Inference. Introductory course designed to familiarize doctoral students with the principles and procedures of statistical inference and to prepare them for more advanced work in research design and analysis. FALL. [3] Staff.

311P. Experimental Design. Application of statistical concepts and inferential techniques to the design and analysis of experiments in the behavioral sciences. Advanced procedures for analysis of variance and analysis of covariance. Prerequisite: 310P or equivalent. SPRING. [3] Schilling.

312P. Multivariate Statistics. Psychological measurement theory, along with correlational and regression analysis techniques essential to the development of that theory. Prerequisite: 310P or equivalent. SPRING. [3] Weiss.

315P. Program Evaluation. The evaluation of social programs. The design of evaluations to produce both theoretically meaningful and practical information about the program and its effectiveness. Such topics as needs assessment, monitoring, impact assessment, and cost/effectiveness evaluations. Covers programs in education, health, and human services. SPRING. [3] Bickman.

319P. Advanced Seminar in Measurement, Statistics, and Evaluation. Special topics in measurement, statistics, and program evaluation. May be repeated with change of topic. Prerequisite: consent of instructor. FALL, SPRING. [3] Staff.

320P. Research in Mental Retardation. Comprehensive introduction to conceptual issues that shape and drive contemporary behavioral research in mental retardation. FALL. [3] Baumeister.

325P. Proseminar in Mental Retardation. (Also listed as Special Education 3250) Variable topics. May be repeated with change in topic. [2] (Not currently offered)

327P. Social Psychology of Mental Retardation. Issues related to mental retardation, with a research emphasis. Attitudes, living environments, families, personality, and relationships. Prerequisite: 320P. [3] (Not currently offered)

329P. Advanced Seminar in Mental Retardation. May be repeated with change of topic. [Variable credit: 1–3] (Not currently offered)

334P. Psychological Foundations of Education. (Also listed as Education 3110) Psychological theories and research as related to the design and practice of education. Specific consideration of the developmental bases of teaching, learning, and student performance (early childhood through adult); individual differences in education with particular reference to socioeconomic status, disabling conditions, learning style, and gender; evaluation of learning; classroom and organizational influences on school effectiveness; family-school relations. FALL, SPRING. [3] Staff.

335P. Psychology of Classroom Learning. Emphasis is on the application of both traditional learning theory and current cognitive theory. Topics include problem solving, programs for teaching thinking and reasoning skills, memory research, and a discussion of the differences between school and nonschool learning environments. [3] (Not currently offered)

336P. Behavioral Pediatrics and Child Health Psychology. Behavioral pediatrics and child health psychology for advanced predoctoral and postdoctoral trainees. Topics include the scope and definition of behavioral pediatrics, measurement of child behavior, children's health beliefs and understanding of illness, theories of psychosomatic illness, immunologic and endocrinologic aspects of stress, compliance, psychological effects of physical illness, families' responses to stress, and psychological intervention strategies. FALL, SPRING. [3]

337P. Family Process. Theories of family interaction and development, with emphasis on research methods used to study family process. Prerequisite: 30lP. [3] (Not currently offered)

338P. Family Therapy. Techniques of family and marital therapy, integrating cognitive-behavioral, systemic, and structural approaches. SPRING. [3] Staff.

339P. Advanced Seminar in Educational Psychology. May be repeated with change of topic. [Variable credit: 1–3]

340P. Psychopathology. The major forms of psychopathology: child, adolescent, and adult. Recent research, classification systems, and developmental variables affecting psychopathology. FALL. [3] Weiss.

341P. Clinical Behavior Therapy and Behavior Modification. Provides a basic understanding of the theoretical rationale, empirical underpinning, and practical applications of clinical behavior therapy and behavior modification. The course highlights traditional perspectives and contemporary methodologies. Significant contributions to applications in different environments and with different populations are surveyed. Linkages among behavioral assessment, behavior counseling, behavioral medicine, clinical biofeedback, and cognitive interventions are examined with a case-study approach. [3] (Not currently offered)

343P. Psychological Assessment. A general introduction to clinical assessment, with a particular emphasis on children. The major purpose is to familiarize students with the theoretical issues and psychometric properties of several different methods of assessment including objective and projective personality measures, behavior checklists, behavioral observation, and clinical interviews. Required before taking practica. Prerequisite: consent of instructor. SPRING. [3] Van Eys.

344P. Psychological Intervention: Individual Focus. Theories and research in psychotherapy. Some initial skill training will be provided. Required before taking practica. Prerequisite: 343P. FALL. [Variable credit: 1–3] Wasserman.

345P. Seminar in Systems and Community Psychology. Systems and social ecology theory, and community applications of systems psychology. [3] (Not currently offered)

347P. Advanced Seminar in Community Psychology. May be repeated with change of topic. FALL. [Variable credit: 1–3] Newbrough.

349P. Advanced Seminar in Clinical Psychology. May be repeated with change of topic. FALL, SPRING. [3] Garber.

350P. Human Learning. Overview of the major experimental approaches to human learning, with an emphasis on the limitations/contributions of each paradigm. [3] (Not currently offered)

352P. Human Cognition. Current research and theory in cognitive psychology. Emphasis on memory, perception, and language. Some applications of cognitive theories are explored. FALL. [3] Schwartz.

353P. Advanced Seminar: Cognitive Studies. Special topics in cognitive studies. May be repeated with change of topic. FALL, SPRING. [3] Staff.

354P. Language and Text Processing. Fundamental survey course in language, required for students in the cognitive studies Ph.D. program. Focuses on the psychological and linguistic aspects of sentence and discourse processing, with some attention to computer simulations. Class sessions are generally a combination of lecture material and student presentation. [3]

355P. Sociobiology. Evolutionary models of social behavior across a wide range of species. Specific topics include: kin selection and inclusive fitness; space utilization; parent-infant interactions; aggression; kin recognition; mate choice and reproductive strategies and communication. FALL. [3] Staff.

357P. Seminar in Behavioral Biology. Selected topics in behavioral biology—e.g., ethology. Content varies according to student needs and interests. May be repeated. [3] Thompson.

359P. Advanced Seminar in Experimental Psychology. Permits advanced students to explore special topics in learning, cognition, and comparative/physiological psychology. FALL, SPRING. [Variable credit: 1–3] Staff.

360P. Developmental Psychology. Central issues, theories, and methods. SPRING. [3] Rieser.

361P. Seminar in Cognitive Development. Major theoretical and conceptual issues in cognitive development. Emphasis in current research topics like memory development, reading, conceptual development, semantic development, problem solving, and reasoning. Recommended background: 352P and/or 360P. [3]

363P. Seminar in Social and Personality Development. Development of personality and social processes, with emphasis on methods of inquiry. Trait theory, socialization

processes, origins of gender differences, cultural differences in childbearing practices, experimental and observational methods in developmental research, and development of motivational systems. SPRING. [3] Walden.

368P. Advanced Seminar in Developmental Psychology. May be repeated with a change of topic. [3]

369P. Master's Thesis Research. Open only to candidates for the Master of Science degree engaged in thesis research and writing. Consent of major professor required. [Variable credit: 1–6]

370P. Theories of Personality. Psychoanalytic theories, phenomenological theories, and behavioral theories. The process of theory development and the interaction of theory and empirical confirmation. FALL. [3] Dokecki.

372P. Group Dynamics. The dynamics of small group behavior through a survey of the group dynamics literature and participation in laboratory experiences. [3] (Not currently offered)

375P. Social Psychology. Emphasis on current theory and research. [3]

376P. Social Psychology of Organizations. The primary goal of the course is to introduce the student to existing research and theory concerning the mutual influences between individuals and organizations. In addition, the course has two secondary goals: (1) to develop skill in applying existing research and theory to live person-organization actions, and (2) to develop skill in the critical analysis of reports of theory and research in the area. [3] (Not currently offered)

378P. Current Research in Social Psychology. A seminar on the current state of the field of social psychology as explored through critical analysis of recent journal articles. May be repeated. [3] (Not currently offered.)

379P. Advanced Seminar in Personality and Social Psychology. May be repeated with change of topic. FALL. [Variable credit: 1–3] Bickman.

380P. Assessment of Intellectual Functioning. The measurement of intellectual functioning; effective report writing; skills associated with test administration and scoring and the development of intelligence over the life span. Behavioral and vocational correlates of intelligence and competence. Methods for psychoeducational remediation. [3] (Not currently offered)

381P. Cognitive Theories of Mathematical Learning. (Also listed as MTED 3810.) Examines the research literature on mathematical learning at the elementary and secondary levels. Considers both the epistemological assumptions and implications of information-processing theories, situated cognition theories, activity theory, and constructivism. [3] (Not currently offered)

382P. Assessment of Personality. Assessment of children and adolescents in varied contexts using personality tests in practical settings, with emphasis on projective testing and the clinical method. Interpretation and report writing. Prerequisite: consent of instructor. FALL. [3] Pinderhughes.

384P. Intervention: Basic Issues. Critical analysis of intervention through examination of the historical, philosophical, political, economic, social, ethical, and value issues that underlie intervention efforts by behavioral and social scientists. [3] (Not currently offered)

386P. Psychological Intervention with Children. Various intervention approaches with children, including parent training, behavior therapy, group therapy, psychopharmacological intervention, individual psychotherapy, cognitive behavioral intervention, psychoanalytic play therapy, and residential treatment. [3]

388Pa–e. Intervention: System Focus. Five approaches to intervention at the system level. Offered in independent modules: (a) Consultation, (b) Grant Writing and Program Development, (c) Organizational Development, (d) Community Development, (e) In-Service Training. [1–3 for each module] (Not currently offered)

389P. Seminar on Psychological Issues and Ethics. Emerging professional and ethical issues confronting psychologists engaged in research or practice. FALL. [1] Dokecki.

390P. Clinical Applications and Practicum I. This two-semester sequence is required for doctoral students in clinical psychology. The sequence involves applications of theoretical principles of behavior change in clinical settings. Didactic meetings will integrate the empirical and theoretical literatures with problems in clinical application. Students will participate in clinical practice (assessment and intervention) under program faculty supervision. Prerequisite: psychopathology, clinical assessment, and intervention, as well as consent of instructor. FALL, SPRING, SUMMER. [3–3] Staff.

391P. Clinical Applications and Practicum II. This two-semester sequence is required for doctoral students in clinical psychology. The sequence involves advanced application of theoretical principles of behavior change in clinical settings. Students will participate in clinical practice (assessment and intervention) under the joint supervision of program faculty and adjunct faculty in community settings. Prerequisite: 390P. FALL, SPRING, SUMMER. [1–1] Staff.

396P. Special Topics in Psychology. May be repeated with change of topic. FALL, SPRING. [Variable credit: 1–4] Staff.

397P. Readings and Research in Psychology. Individual programs of reading or empirical research in psychology. Prerequisite: consent of faculty supervisor. May be repeated. FALL, SPRING, or SUMMER. [Variable credit: 1–3]

399P. Ph.D. Dissertation Research.

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

Religion

CHAIR Douglas A. Knight
DIRECTOR OF GRADUATE STUDIES Douglas A. Knight
PROFESSORS EMERITI James Barr, Edward Farley, H. Jackson Forstman, Frank Gulley, Jr., Walter Harrelson, Joseph C. Hough, Jr., Winston L. King, Liston O. Mills, Lou Silberman, Eugene TeSelle
PROFESSORS Lewis V. Baldwin, J. Patout Burns, David G. Buttrick, Volney P. Gay, Lenn E. Goodman, Thomas A. Gregor, Howard L. Harrod, Peter C. Hodgson., Dale A. Johnson, Douglas A. Knight, Amy-Jill Levine, Sallie McFague, M. Douglas Meeks, Daniel M. Patte, Jack M. Sasson, Fernando F. Segovia, Richard M. Zaner
VISITING PROFESSOR Marjorie Suchocki
ASSOCIATE PROFESSORS Victor Anderson, Beth Ann Conklin, Idit Dobbs-Weinstein, William Franke, Peter J. Haas, Bonnie J. Miller-McLemore, John D. Monaghan, Darren E. Sherkat, Renita J. Weems, D. Don Welch, Jr.
ASSISTANT PROFESSORS Paula Kane Robinson Arai, L. Susan Bond, Paul J. DeHart, Leonard Hummel, Gay House Welch
LECTURERS Randall M. Falk, Jay Geller

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 with an M.Div. degree or its equivalent. 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. 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. (Master of Theological Studies) program in the Divinity School of Vanderbilt University as preparation for Ph.D. work.

Degree programs are offered in biblical studies (Hebrew Bible and New Testament), history of Christianity in Europe and North America, history of Christian and Jewish thought, systematic and philosophical theology, religious and social ethics, religion and personality, and history and critical theories of religion. 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 the biblical 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, and/or to attain a foundation for further studies at the doctoral level. *A thesis is required.* Candidates may choose one of the following programs:

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: Hebrew Bible, New Testament, historical studies, theological studies, ethical studies, religion and personality, homiletics and liturgics, and history and critical theories of religion. The remaining hours may be chosen from the above areas or from other departments of the Graduate School.

2. *General M.A.*   This program provides an opportunity for a broad study of religion guided by individual interests and goals. Students may choose to concentrate on a critical study of the history and literature of the Jewish and Christian religions. They may be primarily interested in gaining a more general understanding of the phenomenon of religion and its role in human life and experience. They will normally be expected to engage in more than one of the various methods of inquiry that have figured in religious studies, such as the human sciences, historical and literary studies, philosophical descriptions and analyses, and theological and ethical interpretations. They will work out with their advisers an integrated program of courses.

3. *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 methodologies and subject matters of the two disciplines in relation to a chosen problem.

4. *Non-thesis M.A.*   The non-thesis M.A. 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; and do not seek candidacy for the Ph.D. degree.

5. *Master's Degree in Passing.*   Ph.D. candidates may earn the master's degree upon completion of at least 42 hours of graduate study, satisfaction of the language requirements, passing the Ph.D. qualifying exam, and approval of the dissertation proposal according to the GDR guidelines.

All M.A. candidates demonstrate reading competence in one foreign language, ancient or modern, as may be required in the program or area of concentration. The student may satisfy this requirement by passing the ETS Graduate School Foreign Language Test with a score of 450 or better 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 available in the following areas of major concentration: Hebrew Bible, New Testament, historical studies, theological studies, ethical studies, religion and personality, homiletics and liturgics, and history and critical theories of religion. Currently, new Ph.D. applications are not being accepted in homiletics and liturgics.

Candidates for the Ph.D. degree must demonstrate a reading knowledge of the following:

A. a modern European language (normally French, German, or Spanish); *and*
B. one of the following:
    1. another modern European language;
    2. a biblical or ancient European language;
    3. a non-European language;
    4. the student's native language, if not English;
    5. a research method such as statistics when appropriate.

Each of the areas of major concentration specifies which of the options under B are acceptable for its students. The requirement in modern European languages may be satisfied by passing the Graduate Student Foreign Language Test with scores of 550 or better or by passing departmental reading examinations. Special arrangements are made for demonstrating competence in other languages. 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.

Carpenter Certificate

Students enrolled full-time in the M.A. or Ph.D. program may earn a graduate certificate in Religion, Gender, and Sexuality. Interested students should contact the Carpenter Program director, A.J. Levine.

I. The Study and Teaching of Religion

3601. Colloquium: The Study of Religion. An interdisciplinary discussion among graduate students and faculty on such topics as the methods, diversities, connections, purposes, and contexts of religious and theological studies today. Required of entering Ph.D. students, open to others. FALL. [0] Staff.

3602. Seminar: The Teaching of Religion. Topics will include the purposes and institutional contexts of teaching religion; pluralism, globalism, and classroom ethics; theories of teaching and learning; course construction and syllabus design; lecturing and discussion groups; student learning, writing, and evaluation; use of technologies and media; placement strategies. Required of entering Ph.D. students; open to a few others with permission. SPRING. [3] Staff.

II. Languages and Methodologies

2500–2501. Elementary Biblical Hebrew. A two-unit course of study leading to a reading knowledge of the Hebrew Bible. 2500: A three-week intensive program in August concentrates on basic elements of the language. 2501: In a regular semester offering the grammar

study is completed and students begin to read from the original texts. Credit for 2500 is given only when 2501 has been successfully completed. Open for credit to M.A. students only. SUMMER, FALL. [1–3] Staff.

2514–2515. Elementary Modern Hebrew. Introduction to alphabet, the basics of grammar, and elementary conversation. Spring: greater emphasis on conversation and grammar. Open for credit to M.A. students only. FALL, SPRING. [3–3] Staff.

2600–2601. Beginning Koiné Greek. A two-unit course of study leading to a reading knowledge of the New Testament. 2600: A three-week intensive program in August concentrates on basic elements of the language. 2601: In a regular semester offering the grammar study is completed and students begin to read from the original texts. Credit for 2600 is given only when 2601 has been successfully completed. Open for credit to M.A. students only. SUMMER, FALL. [1–3] Staff.

3101. Readings in Biblical Hebrew. A reading course in selected texts of the Hebrew Bible for students who have taken 2500–2501. SPRING. [1] Staff.

3102–3103. Intermediate Modern Hebrew. Modern Hebrew reading, conversation, and advanced grammar. Spring: greater emphasis on reading and writing. Prerequisite: one year of Modern Hebrew or its equivalent. FALL, SPRING. [3–3] Staff.

3180. Readings in the Greek New Testament. A reading course in selected New Testament texts for students who have taken beginning Greek. SPRING. [1] Staff.

3802. Exegesis Seminar. Study of the principles, methods, and tools used in the critical study of the Hebrew Bible, including textual, historical-critical, ideological, literary, and other exegetical methods. [3] Weems. (Offered 2001/02)

3814. Intermediate Hebrew. Designed for students who have completed an elementary course in Hebrew and need more work in the areas of grammar, syntax, and reading of Hebrew texts. [3] Weems. (Offered 2000/01)

3815. Ugaritic. Elements of Ugaritic grammar, with reading in selected texts. Prerequisite: Elementary Biblical Hebrew. [3] Knight.

3816. Advanced Hebrew. Reading of selections from the Hebrew Bible, with emphasis on syntax and text criticism. Prerequisite: Elementary Biblical Hebrew. SPRING. [3] Knight.

3818. Aramaic. Vocabulary, forms, and syntax of Aramaic through reading of the Aramaic sections of Daniel and Ezra and of specimens of material from the Elephantine papyri, the Targums, etc. Prerequisite: 3816. [3] Haas.

3821. Syriac. Vocabulary, forms, and syntax of classical Syriac, with readings from the Peshitta, Ephraem Syrus, etc. [3] Haas. (Not currently offered)

3824. Elementary Ethiopic (Ge'ez). A one-semester introduction to the grammar and syntax of classic Ethiopic (Ge'ez) for students who want to make use of the Ge'ez Bible. [3] (Offered on demand)

3826. Advanced New Testament Greek. Knowledge of Greek required. [3]

3827. Readings in Hellenistic Greek. Reading, translation, and grammatical analysis of select Greek texts from the Hellenistic period. Selections from the Septuagint, the New Testament, Josephus, Philo, the apostolic fathers, and the papyri. Emphasis on problems of translation and grammar, with special emphasis on the divergence of the Koiné from classical norms and the influence of the Semitic languages. [3] (Not currently offered)

3831. Akkadian. Elements of Akkadian (Assyro-Babylonian) grammar, with reading in selected texts. Consent of the instructor required. [3]

3832. Akkadian. Reading in selected historical, mythical, legal, and epistolary texts. Consent of the instructor required. [3] Knight. (Not currently offered)

3837. Seminar: Multidimensional Critical Exegesis. An examination of the interrelations of historical-critical, semio-structural, literary, and social-scientific methodologies as theoretical framework for multidimensional practices of New Testament critical exegesis. Multidimensional exegesis as androcritical, and its relation to feminist, African American, and other advocacy and liberation hermeneutics. Knowledge of Greek required. [3] Patte. (Not currently offered)

3838. Structuralist Methodologies and the Humanities. A study of structuralist (and semiological) methodologies aimed at preparing the student for the use of structural methods in various disciplines. Structural linguistics, structural anthropology, structuralism and psychology, as well as various semiological literary methodologies presented by specialists in these fields. The computability of some of these procedures, their relationship with information science, and the philosophical implications. [3] Patte. (Not currently offered)

3839. Cultural Criticism and the New Testament. An introduction to the paradigm of cultural studies in biblical criticism, with a focus on theoretical orientations, approaches to the text, and interpretations of texts. Previous work in biblical criticism required. SPRING. [3] Segovia.

III. History and Critical Theories of Religion

3156. Jewish and Christian Self-Definition. [3] *See description under New Testament and Early Christianity*

3311. Modern Critics of Religion. [3] *See description under Theology*

3500. What is Religion? The ways of studying religion and the understandings of religion which lie behind these approaches. Resources drawn from contemporary scholars and from the world's religions as interpreted by members of the department. [3] (Offered 2000/01)

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] Haas. (Offered 2000/01)

3502. Judaism and Modernity. A historical and cultural analysis of the dilemmas Jewish emancipation presented to both Jews and non-Jews, examined through the study of a variety of popular and elite cultural representations of Jews. How antisemitism became entangled with the problems of gender, sexual, racial, class, and self-identity. SPRING. [3] Geller.

3503. The Jewish Heritage. A survey of Jewish history and literature for a better understanding of Jesus's Jewish roots and its important foundation of both Christianity and Islam. Sponsored by the Jewish Chautauqua Society. SPRING. [3] Falk.

3505. Jewish Ethics. The logic and basic values in the Jewish tradition guiding thinking about moral problems, Jewish discussions concerning family and social ethical issues, found in Talmud and other classical texts. Readings in modern Jewish thinkers on how these basic religious views are appropriated in contemporary Jewish life. [3] Haas.

3509. Introduction to the History and Critical Theories of Religion. Overview of major thinkers and works that have defined the scientific and critical study of religion. FALL. [3] Staff.

3511. Zen Buddhism. The development of Zen Buddhism in China and Japan, with special attention to its basic philosophy, its position within Mahayana Buddhism, its meditational techniques, and its contemporary significance. SPRING. [3] Arai.

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] Arai. (Offered 2000/01)

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. SPRING. [3] Harrod.

3515. Women in Buddhist Traditions. Exploring Buddhist traditions through the contributions and concerns of women in various cultural contexts (India, Sri Lanka, Thailand, China, Japan, and North America) and time periods (ancient and modern). Critical analysis of practices, texts, and hermeneutical schemes that foster divergent images of women. FALL. [3] Arai.

3518. Religious Values in Japanese Culture. The impact of the various religious traditions on the development and character of Japanese culture. Emphasis on the martial arts, popular culture, drama, poetry, and literature, especially modern novels and short stories. [3] Arai.

3519. East Asian Folk Religion. The structure and function of religious beliefs and practices at the popular level in China, Japan, Korea, Taiwan, and Okinawa. Prerequisite: any course in religious studies, anthropology, or East Asian studies. [3] (Offered 2001/02)

3520. Religious Traditions in Japan. The historical developments of various components of Japanese religions, including Shinto, Buddhism, Confucianism, Daoism, Christianity, folk religion, and the contemporary new religions. [3] Arai. (Offered 2001/02)

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. SPRING. [3] Baldwin and Haas.

3522. Myth, Ritual, and Symbol. Various theories concerning myth and symbol. The specifically religious and humanistic content is sought through the study of a wide variety of myths and symbols in primitive and modern religions. [3] Geller. (Offered 2001/02)

3524. The Holocaust: Its Meanings and Implications. The systematic destruction of the European Jewish communities during World War II. Historical, social, political, and cultural developments which led to it. Psychological and sociological dimensions of its aftermath. Philosophical and theological problems it raises for both Jews and Christians. FALL. [3] Geller.

3525. History of the Study of Religion. Examination of pivotal issues, schools, and theorists in the study of religion. [3]

3531. Religious Narrative and the Self. The construction of identity in religious autobiography: motivations (personal salvation, witness, proselytism); relationships among self, God, and religious tradition; role of memory; oral vs. written; cultural, gender, and religious differences. Readings may include Augustine, Gandhi, Malcolm X, Angelou, Wiesel. [3] Geller. (Offered 2000/01)

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. (Offered 2000/01)

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. (Offered 2000/01)

3690. Master's Thesis Research. [0]

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. (Hebrew prerequisite). [3] Haas.

3880. Seminar: Rabbinic Judaism. [3] Haas.

3960. Special Topic: The Complementarity of Science and Religion: The Nature of Knowledge. FALL. [3] Haas.

3982. Reading Course in Judaism. May be repeated. FALL, SPRING. [1–3] Staff.

3985. Reading Course in History and Critical Theories of Religion. May be repeated. FALL, SPRING. [1–3] Staff.

3990. Ph.D. Dissertation Research.

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

Arts and Science courses

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

Anthropology 250. Shamanism and Spiritual Curing. A crosscultural inquiry into shamanism and sorcery. Examines altered states of consciousness, hallucinogens, spirit possession, and nontraditional techniques of curing. Contrasts shamanism with Western approaches to curing. Implications for religion, theories of the mind, and dream analysis. FALL. [3] Conklin.

Anthropology 264. Models of the Mind. Theories of the human mind, consciousness, soul, and self from Western and non-Western perspectives. The models of the mind expressed by myths, theologies, medical systems, and private fantasies. Methods used to

investigate the problem of mind in anthropology, psychiatry, and religion. Consent of instructor. [3] Fisher.

Philosophy 211. Medieval Philosophy. Comparative study of key figures in Islamic, Jewish, and Christian philosophy as they struggle with the philosophy of logic, metaphysics, language, culture, politics, ethics, and nature. FALL. [3] Goodman.

Philosophy 218. Hellenistic and Late Ancient Philosophy. Philosophical ideas of Stoics, Cynics, Epicureans, skeptics, Peripatetics, Neoplatonists, and early monotheist thinkers such as Philo, Origen, and Philoponus. [3] Goodman.

Philosophy 231. Philosophy of History. Focus on alternative conceptions of time and history in Aristotle, Augustine, Kant, Hegel, Heidegger, and Benjamin. [3] Dobbs-Weinstein.

Philosophy 332. Seminar: History of Philosophy. Topics for 1999/2000:
Wittgenstein. FALL. [3] Medina.
Aristotle. SPRING. [3] Goodman.
Kant. SPRING. [3] Bernstein.

Sociology 246. Sociology of Religion. Theories of nature, function, and structure of religion. Religion in America, including fundamentalism, the Black Church, and cults. How religion changes and is changed by secular society. FALL. [3] Sherkat.

IV. Hebrew Bible and Ancient Israel

2503. The Literature, Religion, and Faith of Ancient Israel. The life and thought of ancient Israel, with emphasis on the community's understanding of itself and of its role in history. Concentrates both on problems of historical and literary introduction and on Israelite religious practice and faith. Not available for Ph.D. credit in biblical studies. FALL. [3] Sasson.

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. FALL. [3] Staff.

3107. Old Testament Theology and Biblical Theology. The problems and the possibilities facing current efforts to interrelate Old Testament theology and biblical theology. [3]

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. SPRING. [3] Weems.

3109. Exilic Prophecy. A study of Hebrew prophecy from the seventh and sixth centuries B.C.E., with emphasis on the prophets Jeremiah, Ezekiel, and Deutero-Isaiah. The work, literature, and thought associated with these great prophets are studied against the background of the events surrounding the Babylonian exile. [3] Knight.

3111. The Pentateuch. A study of the first five books of the Hebrew Bible as the key for understanding Israelite history and theology and as the base point for some of the most critical questions in the study of biblical literature. [3] Weems.

3112. Apocalyptic. A study of the early Jewish and Christian apocalyptic movements and literature. FALL. [3] Knight, Levine.

3113. The Wisdom Literature. 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] Weems.

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. FALL. [3] Weems.

3116. Law in the Hebrew Bible. The legal materials in the Pentateuch, their relation to the prophetic movement, and the role of law in ancient Israel's thought and society against the ancient Near Eastern background. [3] Knight.

3117. The Ethics of Ancient Israel. A descriptive study of the ethics of Israel, seeking to understand the effect of religion and history on the Israelites' effort to order their society and to influence moral behavior. Views of humanity, the relationship between the individual and the community, the place of politics in establishing justice, the treatment of socially vulnerable persons, and other topics. Connections drawn to such theological concepts as covenant, righteousness, and wholeness. [3] Knight.

3120. Politics and the Economy in Ancient Israel. The political and economic systems of ancient Israel, with attention to the impact of the centralized monarchic government on the economy of the country. Political processes, rights, and obligations are examined, as well as economic options, stratification, and commercial and property law. Biblical evaluations, especially prophetic critiques of the abuse of power, are explored. [3] (Offered 2001/02)

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] Weems. (Offered 2001/02)

3123. The Book of Exodus. General exegesis of the Book of Exodus, concentrating on the definition of its major themes and purposes. If necessary, additional time may be allotted for those requiring extra work in Hebrew or in textual criticism. [3]

3124. Esther and Ruth. Explores the two books in the Hebrew Bible named for women. Examines Hebrew narrative technique and feminist and postmodern criticism. [3] Weems.

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. (Offered 2000/01)

3132. Suffering and Evil in the Hebrew Bible. The way in which, in light of the humiliating experience of the Exile, ancient Israel's experience of suffering as the people of God influenced the shape of its literature and religion. Attention to topics of evil, sin, divine judgment, and suffering—both merited and unmerited. [3] Weems.

3134. The Ideology of Race and Gender in the Hebrew Bible. The extent to which Hebrew scriptures reflect the ethnic, gender, and dualistic attitudes of ancient Hebrew culture. Particular emphasis given to the extent to which, if at all, biblical perspectives on power, election, and authority are to be applied to contemporary society. [3] Weems. (Not currently offered)

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]

3143. Fundamentalism and Biblical Authority. The concept of fundamentalism and its manifestations in religion to the nature and authority of the Bible. Focus on ideas of scriptures within the Bible itself and within later interpretation; *sola scriptura* and the Protestant Reformation; conflicts with rising trends in history and science; relations with evangelicalism; liberalism and modernism; social and political aspects including war and peace, wealth and poverty, racialism and the place of women; effects in churches and ecumenism; similarities to, and differences from, the fundamentalisms in Judaism, Islam, and other religions; practical steps for reduction of conflict. [3] (Not currently offered)

3690. Master's Thesis Research. [0]

3803. Ben Sira with Introduction to Mishnaic Hebrew. Introduction into grammar and vocabulary of Mishnaic Hebrew, with practice in reading and guidance for further study. Reading of selected portions of the Hebrew text of Ben Sira. Emphasis on the experience in reading unpointed Hebrew text of this period, relevance for textual criticism, use of the Greek version, and the place of the book and its theology in the development of Israelite wisdom in general. [3] (Not currently offered)

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] Weems. (Offered 2000/01)

3806. The Song of Songs. The Song of Songs text, analysis of the literature, study of the religious significance and social background of the book, and its place in the theology of the Hebrew Bible. Prerequisite: knowledge of biblical Hebrew. [3] Weems. (Offered 2001/02)

3807. Proverbs. Analysis of the Book of Proverbs, with emphasis upon translation, themes, and literary features and the function of aphorisms and instructions in the ancient Near East. [3] (Not currently offered)

3808. Seminar: Hebrew Bible. Reading of selected writings and critical reflection on their significance for clarifying the Hebrew Bible. Knowledge of Hebrew required. [3] (Not currently offered)

3809. The Sociology of Early Israel. The nature of Israelite society, especially in its early periods, through readings in source materials and selected sociological interpretations. [3] Knight.

3811. Modern Interpreters of Ancient Israel. Characteristic approaches to the history and religion of ancient Israel, as seen in selected writings by prominent scholars since the Enlightenment. Attention to the presuppositions of each scholar and to the view of Israel afforded in each study. Reading ability in German desired. Consent of instructor needed for non-Ph.D. students. [3] Knight.

3812. Postexilic Literature and Theology. The literary heritage of ancient Israel from about 538 B.C.E. to 165 B.C.E. Attention to postexilic portions of the book of Isaiah; Haggai; Zechariah; Malachi; I and II Chronicles; Ezra-Nehemiah; Ruth; Esther; Song of Songs; Daniel. The variety of theological perspectives found in this period of Israel's history and the character of religious thought prior to the Maccabean period. [3] (Not currently offered)

3813. History of Ancient Israel. Examination of the major areas of debate in the reconstruction of the history of ancient Israel. Analysis of important extra-biblical material that may help shed light upon this topic. Special attention given to the major role that some of its

ancient Near Eastern neighbors played in shaping ancient Israel's history. [3] Weems. (Offered 2000/01)

3823. Literature in the Ancient Near East. Readings in the literature from Egypt, Canaan, and Mesopotamia, with special emphasis on texts relating to the culture, literature, and thought of ancient Israel. FALL. [3] Sasson.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3974. Reading Course in Hebrew Bible. May be repeated. FALL, SPRING. [1–3]

3990. Ph.D. Dissertation Research.

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

V. New Testament and Early Christianity

2511. Literature, Religion, and Faith of Early Christianity. 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. SPRING. [3] Patte.

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. FALL. [3] Staff.

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. (Not currently offered)

3151. Jesus and the Early Christian Communities. How the Gospel writers present the traditions about Jesus in response to historical problems and religious questions current in first-century communities. The relation of the Jesus of history to the Gospel portrayals. Prerequisite: 2511, or its equivalent. [3] Levine.

3152. Interpreting the Gospels. Recent research on the theology, community problems, and polemical interests possibly influencing the authors of the canonical Gospels. Form-critical, redaction-critical, sociological, and literary studies used to determine whether one may indeed call the evangelists "theologians." [3] Segovia. (Offered 2000/01)

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. FALL. [3] Levine.

3156. Jewish and Christian Self-Definition. A study of the various options (social, theological, scriptural, practical) facing Jews and Christians in the first three centuries C.E. and of the processes by which the various communities narrowed those options in their attempts to establish a normative identity. [3] Levine. (Offered 2000/01)

3160. Synoptic Studies. Introduction to basic issues of synoptic research and methodology, with an emphasis on the message and theology of the individual evangelists. [3] Patte.

3161. The Parables in Exegesis and Interpretation. The nature of parable as form; the history of the interpretations of parables; the study of parables in the setting of the ministry of Jesus and the theology of the Evangelists; and literary criticism and the interpretation of the parables. [3] Levine.

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. (Offered 2001/02)

3163. Exegesis of Selected Pauline Letters. Selected Pauline letters are the base from which the character and content of Pauline theology are explored. The development of basic skills in exegesis is emphasized. [3] Patte.

3164. The Fourth Gospel and the Letters of John. Exegesis of selected passages of the fourth gospel, with emphasis on the major Johannine themes and symbology. SPRING. [3] Segovia.

3165. Matthew. Reconstructions of Matthew's audience (actual and ideal), Christology, ethics, ecclesiology, debates with the synagogue, politics, and artistry of composition studied, utilizing various analytical approaches (historical-critical, literary, sociological, ideological). [3] Levine. (Offered 2001/02)

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. FALL. [3] Patte.

3167. History of Reception of the New Testament and Exegesis. Selected instances of the reception of New Testament texts throughout the history of the Church and today, in the East and the West, in the "first" and in the "two-thirds" world, by religious and secular readers as well as by biblical scholars. Special attention to the interface of these diverse readings and of contemporary critical interpretations. SPRING. [3] Patte.

3169. Feminist Interpretations of Scripture. Examination of the representations of women, religious and ethnic "others," and sexuality in biblical and contemporary noncanonical (ANE, Pseudepigrapha, Gnosticism) texts, utilizing various approaches (literary, historical, anthropological, ideological, Womanist, Mujerista). [3] Levine. (Offered 2000/01)

3172. The Early Church and Its Divisions. Examines controversies, conflicts, and divisions in the Early Church from debates within Judaism to the movements toward Gentile environment, and the disputes with Gnosticism in the second century. [3]

3173. The Social World of Early Christianity. Introductory reading in the social approach to the New Testament. Application of social categories and models to selected New Testament texts. Previous work in New Testament exegesis required. [3] Segovia. (Not currently offered)

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. (Offered 2000/01)

3175. The World of Early Christianity: Cultural Matrix and Values. An analysis and interpretation of the New Testament from the perspective of Mediterranean societies. Topics

include honor/shame as core values; the understanding of the individual, male and female; relationships among individuals; the character of family and kinship groups; the conception of purity and impurity. [3] Segovia.

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. FALL. [3] Segovia.

3344. Contemporary Biblical Hermeneutics: The U.S. Scene. An analysis of the methods and goals of biblical interpretation in the United States since the decline of historical criticism, with special focus on reader response criticism and the relationship between social location and interpretation. [3] Segovia.

3345. Contemporary Biblical Hermeneutics: The Global Scene. An analysis of the methods and goals of contemporary biblical interpretation in Africa, Asia, Latin America, and the West. [3] Segovia. (Offered 2001/02)

3347. Acts of the Apostles. Exegesis of selected passages from Acts 1–15 with foci on various methodological perspectives. Greek required. [3] Levine. (Offered 2000/01)

3690. Master's Thesis Research. [0]

3830. Methods of New Testament Criticism. Current methods of New Testament analysis, including textual, source, form, redaction, sociological, semiotic, and literary criticisms. [3] Segovia. (Offered 2000/01)

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. (Offered 2000/01)

3835. Seminar: The Social World of Early Christianity. Selected topics in social world studies. Knowledge of Greek required. [3] Segovia. (Not currently offered)

3836. Seminar: Structural Exegesis of the New Testament. Structural exegesis of various texts of the New Testament using methods derived from semiological literary criticism (Greimas, Barthes) and from structural anthropology (Lévi-Strauss). Prerequisite: Greek. [3] Patte. (Not currently offered)

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. SPRING. [3] Segovia.

3841. Seminar in New Testament. [Variable credit] (Not currently offered)

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] (Not currently offered)

3844. Gospels and Genre Studies. Critical analysis of generic proposals regarding the canonical gospels in the light of contemporary literary genre theory. [3] Segovia.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3975. Reading Course in New Testament. May be repeated. FALL, SPRING. [1–3]

3990. Ph.D. Dissertation Research.

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

VI. History of Christianity

2564. Martin Luther King, Jr., and the Social Roles of Religion. King's role as a religious leader and as an agent of social change, with some attention to the intellectual sources of his thought and social activism. His views concerning the social roles of religion are seen against the background of classical Christian views, late nineteenth-century dissenting traditions, the early twentieth-century American Social Gospel Movement, and the more radical ideas of Malcolm X and Albert B. Cleage, Jr., during the 1960s. Critical evaluations of King are also made in terms of classical Christian views (e.g., Aquinas, Luther, Calvin, Wesley). FALL. [3] Baldwin.

2701. The Formation of the Catholic Tradition. Expansion of Christianity, development of doctrine, relationships with the Empire, and changing modes of Christian life from the second century into the middle ages, with emphasis on the periods and themes formative of classical doctrines and institutional patterns. FALL. [3] Burns.

2703. Christianity in the Reformation Era. The setting of the Reformation (c. 1500–1648) and its development. The significant ecclesiastical, theological, and historical issues of the period. Backgrounds and causes; examination of major individuals and ecclesiastical patterns. An understanding and interpretation of the events. Major theological documents and questions of continuing historical interest that have come out of the Reformation. SPRING. [3] Johnson.

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] Johnson. (Offered 2000/01)

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. FALL. [3] Byrd.

2863. The History of African American Religion I. Covers African retentions in slave religion, the rise of independent black churches, and various roles of black churches in the abolitionist movement, the Underground Railroad, the Negro Convention Movement, and other struggles for liberation up to 1865. [3] Baldwin.

2864. The History of African American Religion II. Traces developments from 1865 to the present, with a focus on the rise of alternative expressions of African American religion, the role of the churches in the civil rights and black power movements, and the emergence of black theology and ethics as intellectual disciplines. [3] Baldwin.

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 which 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. [2] Meeks.

3192. Theology in the United Methodist Tradition. The history of theology in the United Methodist tradition, beginning with John Wesley and the rise of English Methodism in the eighteenth century. The major doctrinal concerns which 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. [2] Meeks.

3200. Puritanism. Its rise, development, and effects, in England and America. Theology, worship, and political and social life and thought. Readings in Puritans and their interpreters. [3]

3202. History of Christian Worship. Catholic and Protestant. Attention to the nature and principles of worship, the primitive tradition, Eastern rites, the Roman Mass, Protestant forms, and modern tendencies. [3]

3204. Religious Life in Nineteenth-Century England. The historical background of modern religious consciousness, as illustrated in Evangelicalism, the Oxford Movement, Christian Socialism, Methodism, Roman Catholicism, and other religious groups. The influence of culture, intellectual currents, and politics on religious life and thought. [3] Johnson. (Offered 2000/01)

3205. Impact of Christian Missions on Native Peoples. Historical impact and contemporary effects of the missionary movement upon selected native people. Attention to the development of missionary policy, its variations among denominations and between Protestant and Catholic, and its relation to policies generated by other institutions, such as the state. [3] Harrod.

3207. Themes in American Christianity. Examination of important interpretive themes in the history of Christianity in America. SPRING. [3] Byrd.

3208. Theology of Martin Luther. Explores the basic shape of Luther's thought. Particular emphasis on the systematic interconnections of the doctrines of God, Christ, scripture, the church, and civil society, based on their relation to the central themes of justification and faith. Readings from a variety of texts in different genres. [3] DeHart. (Offered 2000/01)

3209. Calvin as Systematician: *The 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. SPRING. [3] DeHart.

3211. Roman Catholicism: French Revolution to Vatican II. Studies in modern Catholic history in Europe and America. Such topics as institutional and intellectual developments, church-state issues, and the relation between religion and culture. FALL. [3] Johnson.

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. SPRING. [3] Johnson.

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] Johnson. (Offered 2000/01)

3217. Church and State in American History. Avoiding the restrictive, narrow character of the "church-state question," the course probes the broader issues of Christianity and culture,

religion and politics, with attention to the Revolution, revivalism, millennialism, social reform/social gospel, religion and the public schools, and the "civil religion" debate. [3] (Not currently offered)

3219. Seminar: American Religious Thought. Major issues or periods in American religious thought. [3]

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. FALL. [3] Johnson.

3227. The Evangelical Movement in America. The evangelical movement from its roots in eighteenth-century Western Europe to its present manifestations in twentieth-century America. The development of this movement in black and white churches during the nineteenth century in America and the religious and cultural contexts in which its major characteristics—literalistic interpretation of the Bible, individual conversion, soul-winning mission, revival—were established. [3] Baldwin. (Offered 2000/01)

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]

3229. Seminar in Wesleyan Theology. The development of Wesley's doctrines of God, grace, and sanctification and their contribution to ecumenical theology. [3] SPRING. Meeks.

3234. Southern Religion and Culture. The histories of evangelical and non-evangelical expressions in Southern religious culture from the colonial period to the present. The ways in which religious values and institutions have shaped and reflected Southern society's overall outlook on issues such as race and gender, revivalism and social reform, and regional identity and nationalism. [3] Baldwin. (Not currently offered)

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]

3250. Seminar in Church History. Variable topics. [3] (Not currently offered)

3269. Eucharistic Faith and Practice. *See courses in Homiletics and Liturgics*

3538. The Black Church in America. The development of the black church from the late 18th century to present. Major attention to black denominationalism, church leadership, and the involvement of the church in the social, cultural, intellectual, political, and economic areas of African American life. [3] Baldwin. (Offered 2000/01)

3690. Master's Thesis Research. [0]

3852. Slave Thought. An examination of the sources and content of African American slave thought, following such themes as God, Jesus Christ, history, the human condition, death and the afterlife, salvation, morality and ethics, scriptures, and the role of religion in society. Attention devoted generally to the sacred world of African American slaves as revealed in narratives, tales, songs, sermons, WPA interviews, myths, aphorisms, proverbs, and magical folk beliefs. [3] Baldwin.

3853. Graduate Seminar in Church History. Themes, issues, and approaches that have received attention in recent historical scholarship. [3] Johnson.

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]

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]

3858. Thomas Aquinas. Aquinas's major theological and philosophical assertions, his conception of the two disciplines and their relationships. All readings available in English translation. [3]

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3978. Reading Course in European Church History. May be repeated. FALL, SPRING. [1–3] Staff.

3979. Reading Course in American Church History. May be repeated. FALL, SPRING. [1–3] Staff.

3981. Reading Course in Historical Theology. FALL, SPRING. [1–3] Staff.

3990. Ph.D. Dissertation Research.

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

VII. Theology

Interpretation, Language, and Belief

2505. Religious Autobiography. A study of various religious traditions through autobiographies which provide an "insider's perspective," the perspective of believers. The intention of the course is to show how beliefs and concepts are actualized in people's lives. Readings consider the genre of autobiography—its nature and purpose as well as its variety (i.e., characteristic differences between autobiographies by men and by women). The focus is on Christian autobiographies but includes authors from other religious traditions. [3] McFague. (Offered 2001/02)

3308. Theology of Education. Classical and contemporary theories of education, focusing on theological interpretations of the educational process and on religious dimensions of teaching. [3] Hodgson. (Offered 2000/01)

3334. Theology and Hermeneutics. Modern and postmodern theories of interpretation and their significance for theological method. [3] Hodgson. (Offered 2000/01)

3335. Religious Language. Symbol, metaphor, and analogy in literary theory, linguistic analysis, and theology. [3] McFague. (Offered 2000/01)

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. (Offered 2000/01)

3690. Master's Thesis Research. [0]

3960. Special Topics in Religion . [3]

3990. Ph.D. Dissertation Research.

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

Current Issues in Systematic and Philosophical Theology

2656. Constructive Christian Theology. The constructive development and reformulation of major themes of Christian theology, considered in relation to the theological tradition and contemporary contextual issues. The themes include theological method, faith and revelation, God, human being, sin and evil, and Christ and redemption. Readings in a selection of classical and contemporary texts. Each student will write a credo, a reasoned statement of personal faith, incorporating contextual as well as theological concerns. FALL. [3] DeHart.

3311. Modern Critics of Religion. An examination of the relationship between the critique of religion and the understanding of modernity. Focus on the writings of Feuerbach, Kierkegaard, Marx, Nietzsche, and Freud. SPRING. [3] Geller.

3315. Ecological Theology. Considers theology from an ecological perspective, that is, in relation to the natural world of which human beings are a part. Focuses on the deconstruction and reconstruction of central Christian beliefs in light of the ecological context, with the help of insights from contemporary science, ecofeminism, and Native American traditions. Assumes and supports the maxim of the World Council of Churches: "Peace, justice, and the integrity of creation." [3] McFague. (Offered 2000/01)

3316. The Doctrine of God. Surveys an array of contemporary constructions of the doctrine of God from a variety of theological standpoints: process, trinitarian, postmetaphysical, narrative, revisionist, feminist, and others. Particular attention given to issues of epistemology, metaphysics, and the tension with classical constructions. [3] DeHart. (Offered 2000/01)

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. FALL. [3] DeHart.

3318. Economy and Christian Faith. 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. Permission of instructor required. FALL. [3] Meeks.

3319. Ecclesiology. The study of recent theologies of the church with concentration on the nature, sacraments, ministries, and mission of the church in twenty-first century societies. SPRING. [3] Meeks.

3320. Christology. Examination of the contemporary discussion of major problems in the understanding of Jesus: person, life, and work; resurrection and presence; relation to divine purpose in history and the cosmos; attention to black, feminist, third world, and Jewish-Christian christological concerns. SPRING. [3] McFague.

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. FALL. [3] Suchocki.

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. FALL. [3] Hodgson and Suchocki.

3330. Seminar: Contemporary Theology. Selected readings in contemporary theologians and theological issues. [3] (Not currently offered)

3331. Theology of Nature. A study of issues that arise when a theological perspective is brought to bear on the subject of nature: ecology and the destruction of the environment, the nature of human beings in evolutionary and biological perspective, and the activity of God in the operations of nature. Works in the history, philosophy, and theology of nature are consulted. [3] McFague.

3340. Feminist Theology. Types of feminist theology including mainline reform theologians, radical feminists, black and Third World theologians, and Goddess theologians. [3] McFague.

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] McFague.

3349. The Religion of George Eliot. Religious themes and theological motifs in selected novels of George Eliot, *Scenes of Clerical Life, Adam Bede, Romola, Middlemarch, Daniel Deronda.* SPRING. [3] Hodgson.

3690. Master's Thesis Research. [0]

3833. Postcolonialism and Theological Studies. Analysis of relationship between Postcolonial Studies and Theological Studies in the contemporary world. Focus on theological production of non-Western world and of non-Western minorities in the West. [3] Segovia. (Offered 2001/02)

3908. Seminar: Systematic Theology. Subject for 1999/2000: The Nature of Theological Construction. SPRING. [3] Hodgson.

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] Hodgson. (Offered 2000/01)

3960. Special Topics in Religion. [3]

3983. Reading Course in Systematic Theology. FALL, SPRING. [1–3] Staff.

3984. Reading Course in Philosophical Theology. FALL, SPRING. [1–3] Staff.

3990. Ph.D. Dissertation Research.

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

Theology and the Christian Tradition

3196. Theology in the Reformed Tradition. The doctrine and theology of the Presbyterian or Reformed Churches from the Reformation to the present in historical context. Classic confessions of faith, influential thinkers (e.g., Calvin, Edwards, Schleiermacher, Barth), schools of thought (e.g., federal theology, Consistent Calvinism, evangelicalism), move-

ments (e.g., Puritanism, revivalism, liberalism), and problems (e.g., ecclesiology, church and state, apartheid). Distinctive aspects of the Reformed tradition, its relevance for contemporary life and thought, and contributions which it can make to ecumenical dialogue. [3]

3325. Protestant Theology in the Nineteenth Century. Major movements in Protestant thought during the nineteenth century, from Schleiermacher to Troeltsch. FALL. [3] Hodgson.

3327. Contemporary Theology. The major movements in Christian thought from the beginnings of dialectical theology to the present. [3] McFague. (Offered 2000/01)

3333. Theology of Karl Barth. An introduction to the thought of one of the most important and controversial theologians of the twentieth century. SPRING. [3] DeHart.

3346. Kierkegaard the Theologian. An advanced exploration of Kierkegaard's philosophy of Christian belief, with particular attention to his analysis of faith, the relation of ethics and religion, sin and human existence, and his metaphysical and theistic assumptions. Based on close reading and classroom analysis and discussion of selected texts from the pseudonymous authorship. [3] DeHart.

3690. Master's Thesis Research. [0]

3918. Schleiermacher. The theology of Schleiermacher, with special focus on *The Christian Faith*. Attention to Schleiermacher's theological method, to selected major doctrines, and to the overall structure of his theology. Other works of Schleiermacher pertinent to these studies: the *Speeches*, the *L cke Letters*, and the *Hermeneutic*. [3] DeHart. (Offered 2001/02)

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3990. Ph.D. Dissertation Research.

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

VIII. Ethics

2814. Religion in Society. Religion as a social phenomenon, with special focus on the contribution of sociological theory to the interpretation of religious experience, church, society, and ministry. [3] Harrod.

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. FALL. [3] Harrod.

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. SPRING. [3] Welch.

3403. Theology and Ethics in America. Major theological/ethical themes in the work of Reinhold Niebuhr, H. Richard Niebuhr, and Paul Tillich. The nature of the good, rules and principles, the moral agent, and situational analysis. The intellectual and ecclesiastical ancestry of each thinker as well as his social location as it shaped his thoughts. [3] Harrod. (Offered 2001/02)

3404. Environmental Ethics. Deals with various literatures and topics in the field of environmental ethics—philosophical, religious, historical, cultural, and scientific perspectives informing the analysis of particular problems. The weight given to one or more of these perspectives varies according to subject matter. [3] Harrod.

3410. Political Ethics. An examination of the political thought of prominent thinkers in American theological and social ethics. SPRING. [3] Anderson.

3411. Ethics and Public Policy Issues. Focus on issues emerging in First Amendment controversies about free speech. Selected other foci. [3]

3412. Ethics and Society. An intensive examination of particular themes or thinkers in social ethics. [3] Anderson. (Offered 2000/01)

3413. Ritual and Religious Experience. Four themes which appear in classical and contemporary literature in the social sciences: religion, religious experience, ritual, and symbol. [3] Harrod. (Offered 2000/01)

3414. Seminar: Social Problems. Provides a context for ethical reflection upon a range of contemporary social problems. Attention paid to the implications of ethical reflections for the construction of social policy. [3] Harrod.

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. (Offered 2001/02)

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. SPRING. [3] Anderson.

3452. Ethics, Law, and Medicine. An examination of specific cases involving the intersection of ethical, medical, and legal concerns in the modern world of health care, including the assumptions, approaches, and concepts respectively employed in decision making for incompetent patients, euthanasia, genetic screening, allocation of organs for transplantation, alternative reproductive technologies, and issues involving informed consent and confidentiality. SPRING. [3] Zaner.

3454. Genetics and Ethics. Explores the many ethical, social, and political issues associated with the work within and inspired by the `Human Genome Project`. Included are issues such as genetic diagnosis and reproductive choices; implications of cloning; genetic counseling; genetic testing and screening; impact on insurance and employment. [3] Zaner. (Offered 2000/01)

3690. Master's Thesis Research. [0]

3951. Methods in Ethics. 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, St. Thomas, Calvin, Luther), modern philosophical ethics (Kant, Mill, Wittgenstein). Examines the place of ethics in public policy, medicine, and law. Required of students in ethics. [3] Anderson. (Offered 2000/01)

3953. Sociology of Religion. An intensive examination of the thought of Weber, Troeltsch, and Durkheim in relation to certain contemporary approaches to sociology of religion. [3] Harrod. (Offered 2001/02)

3955. The Moral Agent. Focus upon fundamental elements of the moral life, to deepen awareness of the various forms of moral agency within the social world. FALL. [3] Harrod.

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. (Offered 2000/01)

3957. Advanced Theological Ethics. Systematic study of a major locus, problem, or thinker in theological ethics. [3] Anderson. (Offered 2001/02)

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3976. Reading Course in Ethics. [1–3] Staff.

3977. Reading Course in Medical Ethics. May be repeated. [1–3]

3990. Ph.D. Dissertation Research.

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

IX. Religion and Personality

3053. Seminar: Contemporary Psychotherapy and Pastoral Counseling. Recent trends in psychotherapy. Theories of personality and personality change, as well as to strategies for psychotherapy. Students will assess critically the implications of these theories for pastoral counseling. [3] Hummel. (Offered 2000/01)

3054. Seminar: Method and Evaluation. The use of the social sciences in the investigation of religious phenomena. The psychological analysis of religion. Representative studies and empirical investigations are sampled. [3] Gay. (Offered 2000/01)

3055. Families: Theory and Practice. An intermediate seminar-style course focusing on practical concerns and theoretical understandings of current family issues and strategic solutions in theology, the human sciences, and ministry. [3] Miller-McLemore. (Offered 2000/01)

3056. Seminar: Pastoral Method. A survey and critical examination of the various literatures on method in practical theology, pastoral theology, pastoral care, and ministry. Attention to the church as the locus for pastoral theology and a focus on questions of understanding and interpretation. [3] Hummel. (Offered 2000/01)

3057. Seminar: Theology and Personality. Developmental theorists such as Gilligan, Fowler, Capps, and Parks with emphasis on critical integration of developmental theory, theological perspective, and pastoral method. [3] (Not currently offered)

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] (Not currently offered)

3059. Seminar: Psychology and Theology. Consideration and assessment of certain human themes common to psychological and theological studies, e.g., bondage, healing, community, love, anxiety, maturity. [3] Miller-McLemore.

3060. Freudian Theories and Religion. Intensive 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. (Offered 2001/02)

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.

3062. Group Dynamics and Process. Methods and theory of small group interaction. Each participant is a member of a small group. The theory and reflection on group process. [3] (Not currently offered)

3064. Practical Theology: Past, Present, and Future. Examines the history, theory, and practice of practical theology. Considers the relationship between practical theology and the other theological fields. Particular attention given to the role of practical theology in theological education, cultural studies, and congregational research. Permission of instructor required. FALL. [3] Hummel.

3065. Psychology of Ritual and Myth. Religious rituals and myths from both Christian and other traditions. Major psychological theories of ritual and myth. Their relevance to an understanding of myth and ritual as religious phenomena. To be offered alternately with 3752. SPRING. [3] Gay

3066. Health and Salvation. Investigates the theory and practice of pastoral health care from theological, historical, psychological, and ethical perspectives. Special attention given to the relationship between health and salvation in particular religious traditions and cultures and in the experiences of men and women. Explores pastoral responses to this relationship in healing services, health-care institutions, health-care ministries, congregational nursing, visitation of the sick, and social advocacy for health care. SPRING. [3] Hummel.

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. FALL. [3] Stroup.

3069. Theories of Personality. A study of representative theorists within the different schools 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] Miller-McLemore. (Offered 2000/01)

3070. Shame and Guilt. The dynamics of shame and guilt in social and personal life from theological, psychological, and pastoral points of view. [3]

3072. Pastoral Theology for Transitions and Crises. Examines various pastoral responses

to persons facing transitions (e.g., birth, vocational choice, partnering, marriage, aging, and dying) and crises (e.g., illness, bereavement, and interpersonal discord). Close attention paid to the theological and psychological dimensions of these experiences. Current research in coping and religious coping theory to develop strategies for theological reflection and pastoral action. SPRING. [3] Hummel.

3073. Seminar: Theological Foundations of Pastoral Care. Literature from selected eras is used to discover the influence of theological and cultural understandings on pastoral care orientations and practices. [3]

3074. Seminar: Pastoral Theology. (Offered 2000/01)

3078. Pastoral Care and Social Issues. The challenge of pastoral theology to address issues in cultural contexts. Attempts to move beyond the individualistic paradigm of psychotherapy toward communal and congregational pastoral care. [3] Miller-McLemore.

3079. Readings in Women, Psychology, and Religion. Focus on dialogue with feminists in the fields of theology, personality theory, and psychotherapy. Investigates (1) new developmental models and self-concepts; (2) altered views of therapy and therapeutic goals; (3) fresh understandings of theological and psychological world views; and (4) implications for pastoral care and theology. [3] Miller-McLemore. (Offered 2001/02)

3081. Spirituality and Pastoral Care. An exploration into the history and contemporary literature on spirituality within the pastoral care tradition. Topics include the differentiation between spiritual direction and pastoral care; the history of the cure/care of souls; feminist spirituality, African American spirituality, and spirituality from the margins. [3] Miller-McLemore. (Offered 2001/02)

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 1) individual health and development; 2) cultural context; and 3) psychotherapy and pastoral care and counseling. Evaluation of the theory in conversation with various critical theological perspectives. [3] Miller-McLemore.

3690. Master's Thesis Research. [0]

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. The life and thought of Jung as illustrated by his autobiography, `Memories, Dreams, Reflections` his theory as a means to understand religious phenomena. [3] Gay. (Offered 2000/01)

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. (Offered 2001/02)

3757. Seminar: Methods in Religion and Personality. Focus on 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, sometimes similar, sometimes disparate, disciplines and enterprises together. Students should expect to apply these methods to their own projects in the field. [3] Miller-McLemore. (Offered 2001/02)

3760. Clinical Seminar. An ongoing case conference required of all Ph.D. students in Religion and Personality. FALL, SPRING. [0–3] Mills and Staff.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3970. Readings in Religion and Personality. FALL, SPRING. [1–3] Staff.

3971. Reading Course in Pastoral Theology. FALL, SPRING. [1–3] Staff.

3990. Ph.D. Dissertation Research.

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

X. Homiletics and Liturgics

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. SPRING. [3] Bond.

3004. Narrative Theology and Preaching. An examination of selected readings in theology of narrative and their impact on homiletic method. Reflection on the interplay of texts, tradition, and narrated experience, with implication for sermonic design. [3] Bond. (Offered 2001/02)

3009. Modern Homiletic Theory. A critical examination of representative homiletic texts from the nineteenth and twentieth centuries for their development of theories of preaching. Parallel developments in contemporary theology, culture, and social thought appraised for their impact upon homiletic theory. [3] Bond.

3010. Homiletic Analysis: The Twentieth-Century Pulpit. Examination of method in homiletic criticism through an analysis of selected American sermons 1950–1990 and parallel literature in homiletic theory. [3] Bond. (Offered 2000/01)

3013. Homiletics and Hermeneutics. The connections between expectations of the interpretation of texts and expectations of preaching. The developments in hermeneutics from Schleiermacher to the present; options for homiletic theory. [3]

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] Bond.

3023. New Testament Rhetoric and Homiletic Theory. Different forms of New Testament literature—miracles, controversies, parables, apocalyptic, etc.—as they pose problems for homiletic method. An attempt to describe a variable homiletic that seeks to relate structure and intention of texts to the design of a communicative language. FALL. [3] Buttrick.

3024. Preaching the Parables of Jesus. Preachers have interpreted parables for centuries. Parables show up regularly in the lectionaries. But recent literary-critical studies have interpreted familiar parables in new ways. Introduction to scholarly literature on parables and to homiletic theory on preaching them. SPRING. [3] Buttrick.

3025. Interpreting Scripture. Review of major biblical themes, with attention to issues raised for homiletic theory by historical scholarship, hermeneutics, and theology. Subject for 1998/1999: Preaching the Resurrection. [3] Bond. (Offered 2001/02)

3029. Preaching Scripture: The Gospel of Mark. A homiletical and theological approach

to the Gospel of Mark. Survey of historical-critical scholarship, hermeneutical approaches, and preaching strategies. Focus on Markan understandings of Christology, suffering, power, miracle, and witness. [3] Bond.

3031. Interpreting Doctrine. Analysis of the language and content of major doctrinal themes, and consideration of issues raised for homiletic theory by contemporary thought and experience. [3]

3033. Preaching and Christian Apocalyptic. Focus on theological issues in preaching eschatological and apocalyptic texts. Survey of classic debates, relationship to Jewish apocalyptic, social location, hermeneutics, and homiletic approaches to preaching apocalyptic. Perspectives on Johannine, synoptic, and Pauline material. FALL.[3] Bond.

3037. Women, Christology, and Preaching. Survey of the impact of various feminist Christologies on homiletic method and theory. Consideration of feminist, womanist, mujerista, Asian, and lesbian discussions of suffering and liberation as they relate to traditional doctrines of incarnation, crucifixion and resurrection; and the implications for Word and Sacrament within Christian communities. SPRING. [3] Bond.

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] Bond. (Offered 2000/01)

3044. Apologetic Preaching. How can preaching explain the gospel to a contemporary audience and, in particular, respond to the questions and doubts that inevitably are raised? [3]

3046. Advanced Homiletic Design. A brief review of the basics of design and hermeneutics, development and preaching of narrative, non-narrative, and topical sermons. Significant attention to image systems, metaphors, and illustrations. [3] Bond.

3065. Psychology of Ritual and Myth. [3] *See courses in Religion and Personality*

3122. Themes for Preaching from the Hebrew Bible. [3] *See courses in Hebrew Bible and Ancient Israel*

3202. History of Christian Worship. [3] *See courses in History of Christianity*

3269. Eucharistic Faith and Practice. A historical examination of the eucharistic theologies and practices of the various branches of Christendom, beginning with the early church. Major focus on contemporary understandings. [3]

3271. Worship in the Reformed Tradition. Sources and contemporary development of liturgical theology in the Reformed tradition. [1]

3413. Ritual and Religious Experience. [3] *See courses in Ethics*

3522. Myth, Ritual, and Symbol. [3] *See courses in History and Critical Theories of Religion*

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3972. Reading Course in Homiletics. May be repeated. FALL, SPRING. [1–3]

3973. Reading Course in Liturgics. May be repeated. FALL, SPRING. [1–3]

3990. Ph.D. Dissertation Research.

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

Social Psychology

❧ THE interdisciplinary program in social psychology provides doctoral students with the opportunity to pursue either a major concentration or a minor in social psychology. Students choose a major concentration in social psychology through the graduate program in psychology, sociology, or management (organization studies). A minor may be chosen through these programs as well as nursing science and psychology and human development. The program is coordinated by an interdisciplinary faculty committee composed of William P. Smith *(Psychology)*, Peggy A. Thoits *(Sociology)*, Bruce Barry and Raymond Friedman *(Management)*, Craig A. Smith *(Psychology and Human Development)*, and Kenneth A. Wallston *(Nursing Science)*.

Students are admitted to and earn the Ph.D. degree in one of the participating disciplines and complete a minimum of five courses in social psychology offered by the programs and approved by the interdisciplinary committee. In addition, participants enroll in an interdisciplinary seminar in social psychology for at least three semesters. Students choosing a major concentration conduct their dissertation research in social psychology.

Prospective students should apply for admission in psychology, sociology, or management and indicate on the Graduate School's application their interest in social psychology. Individuals already studying in these disciplines may elect at any time to complete a major or minor concentration in social psychology, and those in nursing science or psychology and human development may satisfy a minor concentration by enrolling in the required course sequence.

PSYCHOLOGY: 361, Interdisciplinary Seminar in Social Psychology.

Sociology

CHAIR Daniel B. Cornfield
DIRECTOR OF GRADUATE STUDIES Karen E. Campbell
PROFESSORS EMERITI Ernest Q. Campbell, Jack P. Gibbs, William A. Rushing
PROFESSORS Daniel B. Cornfield, Walter R. Gove, Larry J. Griffin, Gary F. Jensen,
    Richard A. Peterson, Ronnie J. Steinberg, Peggy A. Thoits
ASSOCIATE PROFESSORS George Becker, Karen E. Campbell, Francis Dodoo,

James J. Lang, Holly J. McCammon, Darren E. Sherkat
VISITING ASSOCIATE PROFESSOR Paul Bagguley
ASSISTANT PROFESSORS Barbara Stanek Kilbourne, Wayne Santoro, Sara Steen
SENIOR LECTURER Ramón Jrade

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

❧ THE sociology program prepares students for research and teaching careers in academic and policy settings. Students are exposed to a wide range of sociological works and research methods. Emphasis is on becoming an independent, social researcher and teacher. Students have an opportunity to work closely with faculty members, in part because of a low ratio of graduate students to faculty members (roughly a one-to-one ratio).

The master's program consists of 39 hours of required course work: 301, 302, 310, 311, 312, one methods seminar, two survey seminars, one special topic seminar, and 12 hours of electives. Also, students must pass the general exam by the end of their fourth semester in order to receive a master's degree. A master's thesis is not required.

Students must satisfy all of the master's degree requirements in order to receive a Ph.D. In addition, Ph.D. degree course work requirements consist of 323, 6–9 hours of advanced preparation, in which the student may work closely with a faculty mentor on an original research project, and 22–25 hours of electives (up to 20 hours of which may be 399). Students must pass a special area exam, 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.

202. Sociolinguistics. (Also listed as Linguistics 202) The social dimension of language use. Variations in language produced by cultural, social class, sex, and age difference and by the occasion of the speech event. FALL. [3] Brennan.

204. Self, Society, and Social Change. (Also listed as American and Southern Studies 204) Problems and prospects for individual participation in social change; volunteering, community service, and philanthropy; role of individuals and voluntary associations in social change. FALL. [3] Cornfield.

220. Population and Society. The mutual influence of demographic factors and social structure. Trends in fertility, mortality, population growth, distribution, migration, and composition. Population policy and national development. [3] (Not currently offered)

224. Women and Law. (Also listed as American Studies 223) History of laws subordinating women and efforts by feminists to achieve substantive and procedural equity. American historical examples augmented by comparative research. Examines employment law, laws making rape and domestic violence illegal, and tax law. FALL. [3] Steinberg.

230. The Family. Study of the relationship of family structure to social organization. Comparative and historical approaches to the family. Recent changes in the American family. Courtship, marriage, marital adjustment, parenthood, and family dissolution in relation to contemporary American society. FALL. [3] Becker.

231. Criminology. The nature, distribution, causes, and control of crime with emphases on contemporary American society and a broad range of types of crime. SPRING. [3] Becker.

232. Delinquency and Juvenile Justice. The nature, distribution, causes and control of juvenile delinquency and the operation of the juvenile justice system in contemporary American society. SPRING. [3] Jensen.

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. FALL, SPRING. [3] Gove, Steen.

234. Prison Life. Prison life from the perspective of prisoners, officials, and the society in which they operate. Off-campus visits to correctional sites, including the Riverbend Maximum Security Institution and the Correctional Officer Training Facility. [3] (Not currently offered)

235. Contemporary American Society. Shifts in the political, economic, and social structure of the United States; changes in technology, demography, and social mores. SPRING. [3] Lang.

236. Class, Status, and Power. Analysis of the competition for jobs, advancement, and income. The influence of social background, education, politics, race, sex, changes in the national economy, and other factors will be considered. Theoretical and empirical analysis focusing on the United States. SPRING. [3] Santoro.

237. Society and Medicine. Cultural and social factors in the perception, definition, diagnosis, treatment, and distribution of disease. Doctor-patient relations; role of nurses and other health professions. Social consequences of hospitals, medical technology, medical specialization, and health insurance. FALL. [3] Thoits.

238. Social Problems of American Medicine. Problems of medical care in the United States in terms of their historical development and of their sociological concepts and principles. [3] (Not currently offered)

240. Law and Society. Examines the relationship between the legal system and other institutions with illustrations drawn from both American and other societies. The actual operation of the legal system including lawyers, courts, and police is described. FALL, SPRING. [3] McCammon.

241. Art in Society. A description of the process of creating, displaying, merchandising, and evaluating art. Analysis of artist circles, production companies, training centers, patrons, critics, dealers, audiences, and government influences in the contemporary American scene as well as in other times and places. [3] (Not currently offered)

242. The Urban Community. Social organization of the urban community. Historical and contemporary patterns in the structure and growth of the city. World urbanism and social change. [3] (Not currently offered)

244. Politics, State, and Society. Topics include the political effects of bureaucratization, social conditions necessary for democracy, the political implications of technological changes, structural differentiation and conflict among elites. Attention is given to formal

models of political processes, such as those of conflict and coalition formation. [3] (Not currently offered)

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. FALL. [3] Sherkat.

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. SPRING. [3] Cornfield.

248. Popular Culture Dynamics. Examination of theories and research which link culture and society. Consideration of the mass media arts with particular emphasis on popular music. Focus on creators, industry, and audiences. FALL. [3] Bagguley.

249. American Social Movements. The effect of key social movements on American society. Comparison of the organization and success of movements such as the American Revolution, Southern Secession, Populism, Woman's Suffrage, and Civil Rights. FALL, SPRING. [3] Bagguley, Santoro.

250. Gender in American Society. Evolving gender stereotypes in American society, gender socialization throughout the life cycle, interpersonal relations, and contemporary social institutions. [3]] (Not currently offered)

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. SPRING. [3] Campbell.

254. Schools and Society: The Sociology of Education. How schools affect individuals and relate to institutions: the government, the economy, social classes, and families. How social attributes, including race and class, affect academic achievement. Controversies such as desegregation and intelligence testing. [3]] (Not currently offered)

255. Racial and Ethnic Minorities in the United States. Status of blacks, Asians, Hispanics, and other minorities. Migration, identity and association, and strategies to improve group status and reduce intergroup tensions. Comparisons to other countries. FALL. [3] Santoro.

257. Gender, Sexuality, and the Body. The body is a physical marker of gender and sexuality. Biological reproduction is saturated with social meanings—shaping ideas about masculinity, femininity, the gender division of labor, and heterosexuality. In this course, we will look at the body as reflexive project and as the site of historical and ideological significance. We address race, ethnicity, physical abilities and class in explaining variations in cultural ideals. SPRING. [3] Steinberg.

258. The South in American Culture. (Also listed as American Studies 258) The changing relationship between the South and the rest of the country and its effects on understandings and definitions of the South, and changes in southern social structures and patterns, race relations, and economic and political institutions. [3]] (Not currently offered)

260. The Individual and Society. How individuals, as social beings, are created by society and how society is in turn created and sustained by individuals. The social self, stigmas, deviance and identity, social structure and personality, small group processes, collective behavior. FALL. [3] Thoits.

261. Work and Family in American Life. The changing relationship between work and family from the Colonial era to the present. Role of the U.S. corporation, specialization of the family, sex roles, social mobility. [3] (Not currently offered)

262. Interpersonal and Intergroup Relations. (Also listed as Psychology 266) An examination of social psychological literature related to intergroup and interpersonal conflict and its resolution, with special attention to problems of relations between black and white in contemporary society. SPRING. [3] Smith.

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] (Not currently offered)

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

270. Human Ecology and Society. Demographic growth, social organization, technology, and the global environment. Sustainable agriculture, ecological degradation. Urban waste and recycling. Community-based approaches to development in Asia and Latin America. SPRING. [3] Gove..

275. Contemporary African Society. The influences of Europe, Asia, and the Americas on the shaping of contemporary African society. Emphasis on how traditional African institutions have persisted or been transformed over time. SPRING. [3] Dodoo.

277. Contemporary Latin America. Distinctive features of contemporary Latin American societies. Recent historical background, political participation, economic growth, authoritarian regimes. Social indicators: health care, literacy, population growth, the distribution of wealth. The shifting context of the international system: foreign debt, trade, corporate investment, North-South vs. East-West tensions. SPRING. [3] Lang.

278. Comparative Asian Development. The historical and cultural development of modern India, China, and Japan. Religious, social, and artistic traditions, contact with the West, independence, and modernization. [3] (Not currently offered)

294. Seminars in Selected Topics. Topics of special interest, as announced in the *Schedule of Courses*. May be repeated for credit once if there is no duplication of topic. [3]

301. Classical Theory. Theoretical perspectives and theorists in the early history of sociology, focusing primarily on Durkheim, Marx, and Weber. FALL. [3] Becker.

302. Contemporary Theory. Modern developments including neo-Marxist, functionalist, structuralist, conflict, interactionist, exchange/rational choice, and feminist theories. SPRING. [3] Bagguley.

310. Sociological Inquiry. Introduction to research methods, including theory construction, sociological reasoning, study design, and specific research techniques. FALL. [3] (Offered 2000/01)

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. FALL. [3] Sherkat.

312. Multivariate Analysis II. The general linear model in analyzing sociological data, including analysis of variance, regression, path analysis, and parametric techniques for contingency-table analysis. Practice in the use of computers. Prerequisite: 311 or an equivalent statistics course approved by the instructor. SPRING. [3] Sherkat.

313. Quantitative Methods Workshop. Analysis of large data sets from the social sciences or of data brought to the course by students. Scaling and measurement; nonparametric analysis of contingency tables; and advanced topics in regression and path analysis. Prerequisite: 312 or an equivalent statistics course approved by the instructor. [3] (Not currently offered)

323. Teaching Workshop. For students wanting to improve their teaching skills. Students visit the classrooms of outstanding teachers on campus and discuss their approach to teaching; deliver lectures in the presence of critics; examine their own lectures on videotape; discuss methods of evaluation; read outstanding books on college teaching; and survey teaching materials produced by the American Sociological Association. Normally limited to graduate students in the department. Graded P/F only. SPRING. [2] (Offered 2000/01)

Courses numbered 331–347 are taught as "survey seminars." Course assignments aim at giving students breadth, and, to that end, a wide range of readings are covered in a seminar format. One of these seminars is usually offered each semester.

331. Survey Seminar on Inequalities and Movements. Relationship between multiple forms of social inequality, such as class, race, and gender inequality, and related social movements. [3] (Not currently offered)

333. Survey Seminar on Cultural Sociology. The creation of culture, including values, norms, beliefs, symbols, and life-styles. The reproduction of society through culture; institutions that purposefully preserve, produce, and transmit aspects of culture. [3] (Not currently offered)

335. Survey Seminar on Deviant Behavior and Social Control. Major works on crime, juvenile delinquency, and forms of extralegal deviance. Social control in connection with counteraction of deviance, sociology of law, and manipulation of human behavior. [3] (Not currently offered)

339. Survey Seminar on Political Sociology. Classical and modern theories about the nature and distribution of power in society and other human groups. The social bases and implications of major political institutions, the state in particular; collective behavior and social movements; and political order and change. [3] (Not currently offered)

341. Survey Seminar on Population Studies and Human Ecology. Population processes, elements of social organization, and their interaction. Major theories and research pertaining to fertility, mortality, migration, urbanization, urban structure, technology, and the division of labor. [3] (Not currently offered)

343. Survey Seminar on Social Psychology. The interaction of social structure and personality. Socialization, social perception, small groups, exchange theory, and symbolic interactionism. SPRING. [3] Thoits.

345. Survey Seminar on Social Stratification. Major theories and lines of research pertaining to the origin, nature, and functioning of systems of social inequality. [3] (Not currently offered)

347. Survey Seminar on Sociology of Science and Knowledge. How ideas and systems of thought are related to the social structure and culture of societies. Institutionalization of scientific and intellectual activity, scientific and intellectual communities or organizations, and social influences on the directions of research by scientists and academicians. [3] (Not currently offered)

Courses numbered 361–371 treat "special topics" in sociology. Title and focus of each seminar depends on the interests of students and the faculty. In all, students are expected to engage in research, design research, or undertake some other kind of creative work, and report the product in a semester paper. One usually offered each semester.

361. Special-Topic Seminars on Social Phenomena at the Macro Level. Each focuses on some aspect of social structure, social organization, culture, international relations, global systems, spatial organization, or the social division of labor. Cities, communities, urban areas, metropolitan areas, regions, countries, or status categories are the principal units of comparison. [3] (Not currently offered)

363. Special-Topic Seminars on Institutions and Organizations. Each focuses on some type of institution—economic, educational, familial, medical, political, or religious—or some type of organization, including business firms and voluntary associations. [3] (Not currently offered)

367. Special-Topic Seminars on Norms, Power, and Related Normative Phenomena. Each focuses on a particular type of deviance, the sociology of law, social control, or political sociology. FALL. [3] Jensen.

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] (Not currently offered)

371. Special-Topic Seminars on Theory and Methodology. Each focuses on a particular theorist, a particular theoretical perspective, the methodology of theory construction, or particular kinds of research methods and statistical techniques. FALL. [3] McCammon.

390a–390b. Directed Studies. Students work independently on topics of special interest not covered in depth in course offerings. Work in a tutorial relationship with an individual faculty member or in a student seminar, subject to faculty approval, should several students share a common interest. Prerequisite: consent of the instructor. FALL, SPRING. [Variable credit: 1–3 each semester] Staff.

395a–395b. Research Practicum. Research with the guidance of individual faculty members on problems of mutual interest. [3–3] Staff.

399. Ph.D. Dissertation Research.

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

Southern Studies

See American and Southern Studies

Spanish and Portuguese

CHAIR Cathy L. Jrade
DIRECTOR OF GRADUATE STUDIES John Crispin
PROFESSORS EMERITI J. Richard Andrews, John L. Bingham
PROFESSORS John Crispin, Earl E. Fitz, Russell G. Hamilton, Cathy L. Jrade, William Luis,
    Christopher H. Maurer, C. Enrique Pupo-Walker, Philip D. Rasico, Francisco Ruiz-Ramón
ASSOCIATE PROFESSOR Victoria A. Burrus
ASSISTANT PROFESSORS M. Fräncille Bergquist, Andrés Zamora
SENIOR LECTURER Elena Olazagasti-Segovia

DEGREES OFFERED:
   SPANISH.   *Master of Arts*, *Master of Arts in Teaching*, *Doctor of Philosophy*
   SPANISH-PORTUGUESE.   *Doctor of Philosophy*
   PORTUGUESE.   *Master of Arts*

❧ THE Ph.D. program in Spanish includes 45 hours of course work with an additional 9–12 hours in a minor which may be Portuguese or an approved program of courses from one or more departments.

The Ph.D. in Spanish-Portuguese requires 54 hours in the two languages, with no fewer than 30 in one language. The doctoral dissertation may be written in either area.

The M.A. programs in Spanish and in Portuguese require 24 hours of course work and an M.A. examination. An alternate M.A. plan with the submission of a thesis in lieu of an examination is available to candidates not wanting to continue toward the Ph.D. at Vanderbilt. Candidates for the M.A. may present a minor of up to 6 hours in a field related to the major, but the minor is not a requirement. A reading language or one other foreign language is also required.

Candidates for the Ph.D. must have a reading knowledge of two other Romance languages to be determined according to their field of specialization. For details, students should consult the department's guidelines and the director of undergraduate studies.

Spanish

101G. Spanish for Reading. Survey of grammar and vocabulary coupled with extensive reading. Available to graduate students for "no credit" only. FALL. [0] Olazagasti-Segovia.

212. Advanced Grammar and Stylistics Review of advanced grammar and syntax through the stylistic analysis of literary texts from several genres and periods. Intended for advanced undergraduate and graduate students. Prerequisites: 201, 202, and 203 or equivalent. Offered every other year. [3] Olazagasti-Segovia, Zamora.

214. Dialectology. Formation, general characteristics, distinctive features, and geographical extension of the principal dialectal regions of Spain and Spanish America. Both historical

and modern dialects are considered. Emphasis on nonstandard dialectal varieties of Spanish. SPRING. [3] Rasico.

216. Phonology. The phonetics and phonemics of the Spanish language. FALL. [3] Rasico.

217. Contrastive Analysis of Spanish and English. A comparison of the phonological, morphological, and syntactical structures of Spanish and English to demonstrate the similarities and differences between the linguistic systems of these two languages. [3] Bergquist. (Offered 2000/01)

218. Morphology and Syntax. Descriptive analysis of word formation and sentence construction in modern-day Spanish. [3] Rasico.

219. History of the Spanish Language. Origins and evolution of the Spanish (Castilian) language. Emphasis on the phonological and morphological development of Spanish within historical and cultural contexts of the Iberian Peninsula. [3] Rasico.

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. [3] Rasico.

230. Development of Lyric Poetry. Popular and traditional forms; the sonnet and other Renaissance and Baroque classical forms. Romanticism. [3] Crispin.

231. The Origins of Spanish Literature. From its beginnings to the Renaissance; the creation of a social order and a cultural tradition. Close study of three literary landmarks— *Poema del Cid, Libro de Buen Amor, La Celestina* and other prose and poetry selections. SPRING. [3] Burrus.

232. Literature of the Spanish Golden Age. Representative works from the *Comedia,* the Picaresque and other prose forms, and lyric poetry, in the cultural context of the Renaissance and Baroque eras. [3] Maurer.

233. Modern Spanish Literature. The eighteenth and nineteenth centuries: essays and Neoclassic literature, Romanticism, Realism, and Naturalism. Representative works and authors from all genres. [3] Zamora.

234. Contemporary Spanish Literature. Representative authors and works from the Generation of 1898 to the present. SPRING. [3] Crispin.

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. [3] Pupo-Walker.

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. [3] Jrade or Pupo-Walker.

237. Contemporary Lyric Poetry. From Modernism to the present in Spain and Spanish America. [3] Crispin or Jrade.

239. Development of the Novel. From the seventeenth century through Realism and Naturalism in Spain and Spanish America. FALL. [3] Zamora.

240. The Contemporary Novel. New forms in the twentieth-century novel in Spain and Spanish America. FALL. [3] Crispin.

244. Afro-Hispanic Literature. From nineteenth-century slave narrative to modern writers such as Miguel Barnet, Alejo Carpentier, and Quince Duncan. [3] Luis. (Offered 2000/01)

246. *Don Quixote.* Directed reading and intensive study of the novel. SPRING. [3] Maurer.

251. Development of Drama. From the Spanish Golden Age through Romanticism. [3] Ruiz-Ramón. (Not currently offered)

252. Contemporary Drama. Twentieth-century theatre. [3] Ruiz-Ramón.

260. Development of the Short Story. From early manifestations in Spain through its current forms in Spain and Spanish America. FALL. [3] Pupo-Walker.

281. The Theory and Praxis of Drama. Critical works and plays from different periods. Introduction to the principles of dramaturgy. [3] Ruiz Ramón.

289. Independent Study. Designed primarily for majors. Projects are arranged with individual professors and must be approved by the director of undergraduate studies, before the close of registration. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed 12 over a four-semester period] Staff.

293. Contemporary Latin American Prose Fiction in English Translation. (Also listed as Portuguese 293) Major themes and techniques. No credit for graduate students in Spanish or Portuguese. [3] Fitz or Jrade.

294. Special Topics in Hispanic Literature and Culture. Topics as announced in the *Schedule of Courses.* FALL, SPRING. [3] Staff.

295. Special Topics in Spanish Language and Linguistics. Topics as announced in the *Schedule of Courses.* FALL, SPRING. [3] Staff.

301. Literary Analysis and Theory. (Also listed as Portuguese 301 and Comparative Literature 313) Methods of literary analysis for the teaching of literature. The systematic application of contemporary theories—structuralist and poststructuralist—in the analysis of poetry and narrative. FALL. [3] Zamora.

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] Rasico.

303. Introduction to the Methods of Literary Research. Guide to the use of library resources, printed and electronic. Directed research on a topic of the student's choice. FALL. [3] Maurer.

310. Foreign Language Teaching: Theory and Practice. (Also listed as French 310, German 310, and Portuguese 310) Current trends in foreign language teaching with special reference to introductory language courses. Topics include linguistic and psychological foundations, methods, skill development, course and lesson planning, text selection, and testing. Required of all entering teaching assistants. FALL. [3] Scott.

331. Seminar: Studies in Medieval Literature. [3] Burrus.

341. Seminar: Poetry of the Golden Age. [3] Maurer.

343. Seminar: Studies in Golden Age Drama. Topics as announced in the *Schedule of Courses.* [3] Ruiz-Ramón.

345. Seminar: Prose of the Golden Age. [3] Maurer.

362. Seminar: The Realistic Novel of the Nineteenth Century. [3]

369. Master's Thesis Research. [0]

371. Seminar: Studies in the Generation of 1898. Topics as announced in the *Schedule of Courses.* [3] Ruiz-Ramón, Crispin.

372. Seminar: Studies in Twentieth-Century Spanish Literature. Topics as announced in the *Schedule of Courses.* [3] Crispin.

387. Seminar: Contemporary Spanish American Novel. SPRING. [3] Luis.

388. Special Topics in Spanish Literature. Topics as announced in the *Schedule of Courses.* [3] Staff.

389. Special Topics in Spanish American Literature. Topics as announced in the *Schedule of Courses.* For list of previous topics, please see departmental Web page. FALL, SPRING. [3] Jrade, Luis.

396. Special Studies in Spanish Linguistics. FALL, SPRING. [Variable credit: 1–6] Staff.

397. Special Studies in Spanish Literature. FALL, SPRING. [Variable credit: 1–6] Staff.

398. Special Studies in Spanish American Literature. FALL, SPRING. [Variable credit: 1–6] Staff.

399. Ph.D. Dissertation Research.

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

Portuguese

205. Introduction to Luso-Brazilian Literature. Critical readings and methods of literary analysis. Selections include masterpieces from Portugal and Brazil and cover all genres in several periods. Emphasis on improving conversational and writing skills. Prerequisite: 200. FALL. [3] Fitz.

223. Culture and Civilization of the Portuguese Speaking World. Distinctive cultural patterns of the Portuguese-speaking world in a historical perspective; painting, sculpture, architecture, music, folkloric traditions, and major currents of intellectual thought. SPRING. [3] Fitz, Staff.

232. Introduction to Brazilian Literature. Main literary trends, principal writers and works of Brazilian literature, from colonial beginnings through the nineteenth century. Study of the works of Gregório de Matos, Gonçalves Dias, Alencar, Machado de Assis and Euclides da Cunha. [3] Fitz. (Offered 2000/01)

285. Modern Brazilian Literature. The development of Brazilian literature from the *Semana de Arte Moderna* to the present. Emphasis on the Modernist and Neo-Modernist movements. [3] Fitz.

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

293. Contemporary Latin American Prose Fiction in English Translation. (Also listed as Spanish 293) Major themes and techniques. No credit for graduate students in Spanish or Portuguese. SPRING. [3] Fitz or Jrade.

294. Special Topics in Portuguese Language, Literature, or Civilization. Topics announced in the *Schedule of Courses.* [3] Fitz.

301. Literary Analysis and Theory. (Also listed as Comparative Literature 313 and Spanish 301) Methods of literary analysis for the teaching of literature. The systematic application of contemporary theories—structuralist and poststructuralist—in the analysis of poetry and narrative. FALL. [3] Zamora.

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] Rasico.

310. Foreign Language Teaching: Theory and Practice. (Also listed as French 310, German 310, and Spanish 310) Current trends in foreign language teaching with special reference to introductory language courses. Topics include linguistic and psychological foundations, methods, skill development, course and lesson planning, text selection, and testing. Required of all entering teaching assistants. FALL. [3] Scott.

385. Seminar: Studies in Contemporary Literature of the Portuguese-Speaking World (Portugal, Brazil, Lusophone Africa). Variable topics to be announced in the *Schedule of Courses* May be repeated with change of topic. SPRING. [3] Fitz.

397. Special Studies in Portuguese Literature. FALL, SPRING. [Variable credit: 1–6] Staff.

398. Special Studies in Brazilian Literature. FALL, SPRING. [Variable credit: 1–6] Staff.

399. Ph.D. Dissertation Research.

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

Theatre

CHAIR, COMMUNICATION STUDIES AND THEATRE Kassian A. Kovalcheck, Jr.
PROFESSORS EMERITI Robert A. Baldwin, Cecil D. Jones, Jr.
ASSOCIATE PROFESSORS Jon W. Hallquist, Terryl W. Hallquist
ASSISTANT PROFESSORS Robert Ball, Phillip Franck
LECTURERS W. David Wheeler, Jodi Karjala

❧ COURSES in theatre may be approved for minor credit in graduate programs.

201–202. The Development of Drama and Theatre. A historical and critical study of significant drama and the physical theatre from the beginning to 1920. 201: Aeschylus to 1642. 202: 1642 to 1920. FALL. [3–3] 201 (Offered alternate years); 202 (Offered alternate years) Ball.

203. Contemporary Drama and Theatre. A critical study of significant drama and theories of theatrical production in Europe and America since 1920, with special emphasis on the emergence of the American theatre to a position of international importance. SPRING. (Offered alternate years) [3] Ball.

204. The Development of the American Theatre. Theatrical activity in the United States from the Colonial period to the present. The course will include the reading of selected plays. SPRING. [3] J. Hallquist.

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❧

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The Harvie Branscomb Distinguished Professor Award, begun in 1964 and awarded annually for a period of one year, recognizes the total 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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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

The Alexander Heard Distinguished Service Professor Award was established in 1982 to honor Chancellor Alexander Heard at the time of his retirement. The title will be conferred annually, for a one-year period, upon a faculty member in recognition of contributions to the analysis and solution of contemporary problems in the society.

1983 DAVID J. WILSON, Professor of Chemistry
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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
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The Earl Sutherland Prize for Achievement in Research was initiated in 1976. The recipient is chosen by the Chancellor on recommendation of the University Research Council.

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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
1988 JOSEPH H. HAMILTON, Landon C. Garland Distinguished Professor of Physics
1989 PAUL K. CONKIN, Distinguished Professor of History
1990 TADASHI INAGAMI, Professor of Biochemistry
1991 EDWARD FARLEY, Drucilla Moore Buffington Professor of Theology
1992 JAMES F. BLUMSTEIN, Professor of Law
1993 THOMAS M. HARRIS, Centennial Professor of Chemistry
1994 JOHN H. EXTON, Professor of Molecular Physiology and Biophysics

1995   GISELA MOSIG, Professor of Molecular Biology
1996   HANS R. STOLL, Anne Marie and Thomas B. Walker Jr. Professor of Finance
1997   JOHN D. BRANSFORD, Centennial Professor of Psychology
1998   ALICE C. HARRIS, Professor of Linguistics and Chair of the Department of
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STANLEY COHEN, Distinguished Professor of Biochemistry; American Cancer Society
    Research Professor of Biochemistry
PAUL K. CONKIN, Distinguished Professor of History
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    Engineering
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ALINE BAEHLER, Assistant Professor of French (On leave 1999/2000)
　　Licence ès Lettres (Université de Genève 1986); D.E.A. (Université de Paris VII 1988);
　　Ph.D. (New York 1993)
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　　B.A. (Kent 1971); M.A., Ph.D. (Illinois 1974, 1977)
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   B.A. (Alaska 1956); M.A., Ph.D. (Peabody 1959, 1961); L.H.D. (Alaska 1988)
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   B.S. (Pittsburgh 1961); M.S. (Denver 1963); Ph.D. (Vanderbilt 1969)
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   B.A. (SUNY, College at New Paltz 1964); M.A. (Columbia 1968); M.S., Ph.D. (SUNY,
   Stony Brook 1972, 1976)
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   B.A., M.A., M.S., Ed.D. (Johns Hopkins 1977, 1978, 1980, 1981)
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   B.S. (Trinity 1970); Ph.D. (Edinburgh 1975)
FRED H. BESS, Professor of Hearing and Speech Sciences and Chair of the Department;
   Professor of Otolaryngology; Investigator, John F. Kennedy Center
   A.B. (Carthage 1962); M.S. (Vanderbilt 1964); Ph.D. (Michigan 1970)
MICHAEL D. BESS, Associate Professor of History
   B.A. (Reed 1979); M.A., Ph.D. (California, Berkeley 1983, 1989)
ALBERT H. BETH, Professor of Molecular Physiology and Biophysics and Vice Chair of the
   Department
   B.S. (Murray State 1974); Ph.D. (Vanderbilt 1977)

BHARAT L. BHUVA, Associate Professor of Electrical Engineering; Associate Professor of Computer Engineering
B.Sc. (Maharaja Sayajirao University of Baroda 1982); M.S., Ph.D. (North Carolina State 1984, 1987)

LEONARD BICKMAN, Professor of Psychology, Peabody College; Professor of Psychiatry; Director, Mental Health Policy Center, Institute for Public Policy Studies
B.S. (City College of New York 1963); M.A. (Columbia 1965); Ph.D. (City University of New York 1969)

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B.S., M.A. (Colorado 1952, 1960); M.A., Ph.D. (Princeton 1962, 1963)

GAUTAM BISWAS, Associate Professor of Computer Science; Associate Professor of Computer Engineering and Director of the Program; Associate Professor of Management of Technology
B.Tech. (Indian Institute of Technology 1977); M.S., Ph.D. (Michigan State 1980, 1983)

JOSEPH D. BLACKBURN, JR., Acting Dean, Owen Graduate School of Management; James A. Speyer Professor of Production Management; Professor of Management (Operations Management)
B.E. (Vanderbilt 1963); M.S. (Wisconsin 1964); Ph.D. (Stanford 1971)

RANDOLPH BLAKE, Professor of Psychology, College of Arts and Science; Investigator, John F. Kennedy Center
B.A. (Texas 1967); M.A., Ph.D. (Vanderbilt 1969, 1972)

RANDY D. BLAKELY, Allan D. Bass Chair in Pharmacology; Professor of Pharmacology; Investigator, John F. Kennedy Center
B.S. (Emory 1981); Ph.D. (Johns Hopkins 1987)

ROBERT BLANNING, Professor of Management (Telecommunications and Electronic Commerce) (On leave 1997)
B.S. (Pennsylvania State 1958); M.S. (Case Western Reserve 1964); Ph.D. (Pennsylvania 1971)

PAUL E. BOCK, Associate Professor of Pathology; Associate Professor of Medicine
B.A. (California, San Diego 1971); Ph.D. (Washington University 1976)

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