Missouri

University of Missouri-Columbia

Graduate Catalog

1999 2001

Contents

The MU Graduate Catalog is on the Internet!

The web site for the Graduate School is:

www.missouri.edu/~gradschl

Information from this catalog is updated on our web site on a regular basis. Check the web for the most current information on degree programs, faculty, courses and general procedures.

Academic Calendar

Fall Semester	1999	2000
Orientation & Registration	Thursday Aug. 19	Thursday Aug. 17
Last Day of Registration	Friday Aug. 20	Friday Aug. 18
Classwork begins, 8 a.m.	Monday Aug. 23	Monday Aug. 21
Labor Day (no classes)	Monday Sept. 6	Monday Sept. 4
Thanksgiving recess begins, close of day*	Friday Nov. 19	Saturday Nov. 18
Classwork resumes, 7:40 a.m.	Monday Nov. 29	Monday Nov. 27
Classwork ends, close of day*	Friday Dec. 10	Tuesday Dec. 12
Stop Day	Saturday Dec. 11	Wednesday Dec. 13
Final examinations begin	Monday Dec. 13	Thursday Dec. 14
Fall semester closes, 5 p.m.	Sunday Dec. 19	Wednesday Dec. 20

Winter Semester	2000	2001
Orientation & Registration	Thursday Jan. 6	Tuesday Jan. 16
Last Day of Registration	Friday Jan. 7	Wednesday Jan. 17
Classwork begins, 8 a.m.	Monday Jan. 10	Thursday Jan. 18
Martin Luther King holiday (no classes)	Monday Jan. 17	Monday Jan. 15
Spring recess begins, 12 p.m.	Saturday March 25	Saturday March 24
Classwork resumes, 8 a.m.	Monday April 3	Monday April 2
Classwork ends, close of day*	Friday April 28	Friday May 11
Stop Day	Saturday April 29	Saturday May 12
Final examinations begin	Monday May 1	Monday May 14
Winter semester closes, 5 p.m.	Saturday May 6	Saturday May 19

Summer Session	2000	2001
8-week session		
Orientation & Registration	Monday June 12	Monday June 11
Classwork begins, 7:30 a.m.	Tuesday June 13	Tuesday June 12
Independence Day recess (no classes)	Tuesday July 4	Wednesday July 4
8-week session closes, 5 p.m.	Friday Aug. 4	Friday Aug. 3

First 4-week session	2000	2001
Orientation & Registration	Monday June 12	Monday June 11
Classwork begins, 7:30 a.m.	Tuesday June 13	Tuesday June 12
First 4-week session closes, 5 p.m.	Friday July 7	Friday July 6

Second 4-week session	2000	2001
Registration	Monday July 10	Tuesday July 9
Classwork begins, 7:30 a.m.	Monday July 10	Tuesday July 9
Second 4-week session closes, 5 p.m.	Friday Aug. 4	Friday Aug. 3

*Close of day is defined as including late afternoon and evening classes.

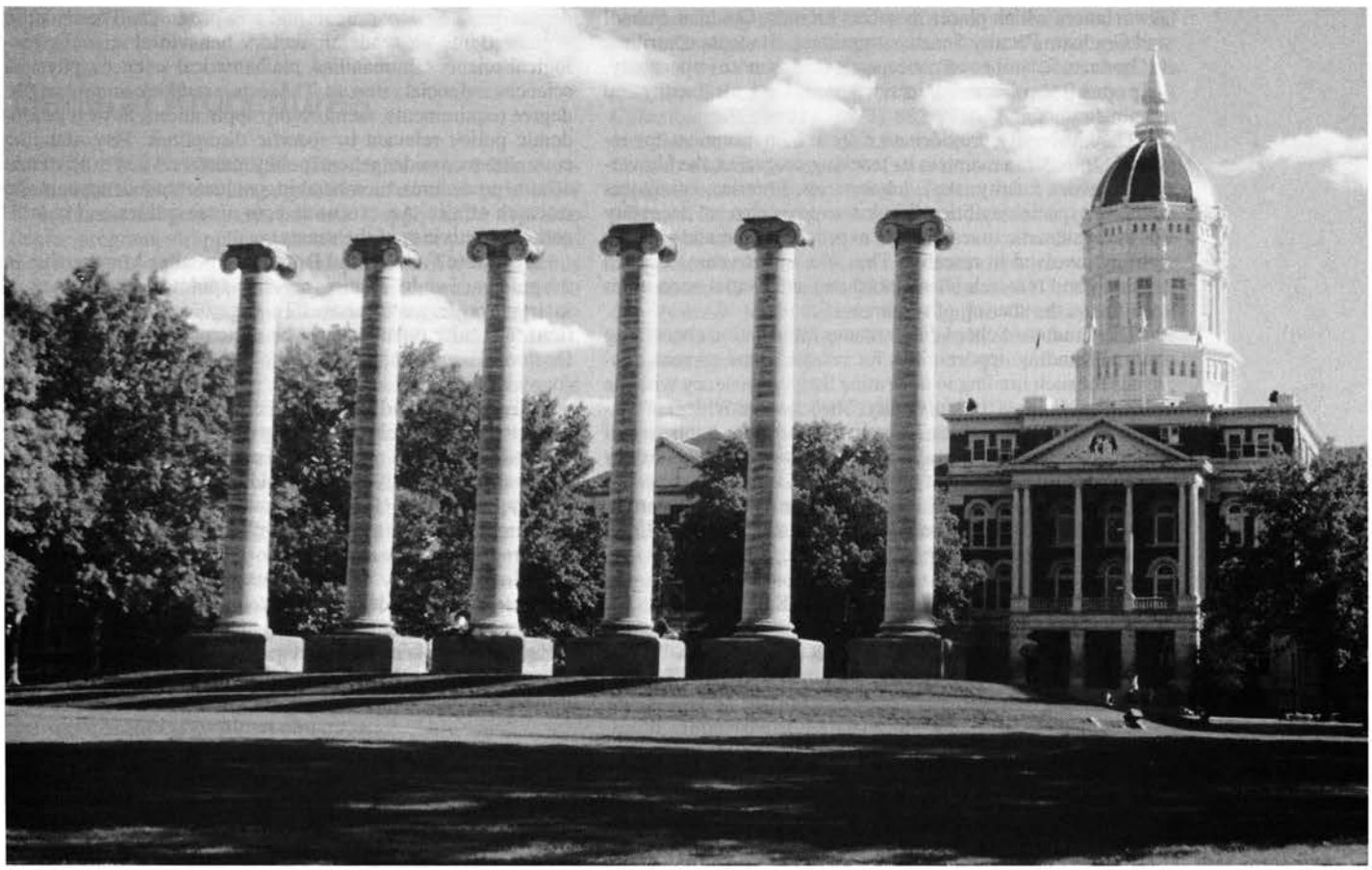
Notice of Nondiscrimination
The University of Missouri-Columbia does not discriminate on the basis of race, color, religion, national origin, ancestry, sex, age, disability, or status as a disabled veteran or veteran of the Vietnam era. Any person having inquiries concerning the University of Missouri-Columbia's compliance with implementing Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Americans With Disabilities Act of 1990, or other civil rights laws should contact the Assistant Vice Chancellor, Human Resource Services, University of Missouri-Columbia, 130 Heinkel Building, Columbia, MO 65211, (573) 882-4256, or the Assistant Secretary for Civil Rights, U.S. Department of Education.

The University of Missouri-Columbia complies with the Americans with Disabilities Act of 1990. If you have a disability and need accommodations in connection with registration or advisement, please notify us at A048 Brady Commons or (573) 882-4696 as soon as possible so that necessary arrangements can be made. TTY users: please call through Relay Missouri, 1-800-735-2466.

If you need this information in an alternative format, please call (573) 882-6311. Note: The University of Missouri-Columbia also has a Disability Services Office that provides support services to students with disabilities; call (573) 882-4696 or TDD 882-8054.

Equity in Athletics Disclosure Act
The University of Missouri-Columbia is in compliance with the Equity in Athletics Disclosure Act of 1994, Section 360B of Pub.L. 103-382. This Act and accompanying federal regulations require that certain information with regard to intercollegiate athletics, including operating expenses, revenue, salaries and participation rates, be made available to current and prospective students and the public. This report is available by contacting the Department of Intercollegiate Athletics at (573) 882-6501.

General 1999 Series, Number 10



Jesse Hall and the Columns are the focal points of the Francis Quadrangle, the oldest and most traditional part of the campus.

MU

The University of Missouri-Columbia, established in 1839, is the oldest state university west of the Mississippi River. MU is the largest of the four campuses of the University of Missouri System. Other campuses are in St. Louis, Kansas City and Rolla.

Master's degrees were first awarded in 1846. The first doctor of philosophy degree was awarded in 1899. MU is one of the most comprehensive and diverse universities in the United States. As a member of the Association of American Universities (AAU) and a university classified "Research I" by the Carnegie Foundation for the Advancement of Teaching, MU is a premier provider of graduate and professional education.

The University offers many developmental experiences outside the classroom, including concerts, theatrical productions, fine art and cultural exhibits, and films. Many campus groups sponsor specialized seminars and lectures by distinguished visiting scholars.

Approximately one-third of MU's budget comes from state appropriations. The sources of the remainder of the budget include private gifts, grants, student tuition and fees, auxiliary enterprises and University Hospital. In 1998, MU received nearly $99 million from outside sources in support of research and other scholarly activities. MU also enjoys broad support from its alumni.

The University is distinguished from other public institutions in the state and in the region by the scope and quality of its graduate programs and its scholarly and creative productivity. Closely interwoven graduate education and research enterprises provide a context for high-quality undergraduate and professional education, and for effective outreach sensitive to the needs of the state.

GRADUATE SCHOOL

MU's Graduate School enrolls approximately 4,000 graduate students in over 90 graduate degree programs. In its history, the school has granted a total of more than 53,185 master's degrees, 1,068 educational specialist degrees and 10,282 doctoral degrees. It is a member of the Association of Graduate Schools and the Council of Graduate Schools.

Graduate programs are designed by MU's graduate faculty to meet both societal needs and the career and intellectual objectives of the individual graduate student. The classic student-mentor relationship is the keystone of graduate education at MU. The Graduate School seeks to assure the people of Missouri that faculty and student research adds significantly to the supply of knowledge. The school also seeks to assure its supporters that new knowledge and skills are transmitted, that traditions are challenged and sustained, and that creative activities and achievements are recognized and supported. Through the University's Office of Research, quality research and creative activities provide various support services for researchers and administers through externally funded research grants and contracts awarded to MU personnel.

Graduate education at MU is dedicated to the development of independent, creative approaches to problem solving and experiential learning. The keys to success include the student-mentor relationship and an intellectual climate conducive to the acquisition of research skills and creative vision. Close interaction with the faculty allows the student to develop scholarly insight. At MU the student-mentor relationship is more than a simple apprenticeship. It is an intellectual partnership rewarding to both parties. Both student and mentor participate in the process of creating new products and new knowledge, and in establishing new perspectives on traditional knowledge.

The school encourages student participation in academic affairs. This effort has resulted in a vigorous Graduate Student

Association, which places members on most Graduate School and Graduate Faculty Senate committees. Students contribute to Graduate School governance, and perhaps more importantly, help open lines of communication among students, faculty and administrators.

The University provides an effective environment for research. In order to maintain its teaching programs, the University provides faculty, staff, laboratories, libraries, computers and other special facilities. These resources also are necessary for the systematic investigation, experimentation and creative activity involved in research. Thus, the effectiveness of both teaching and research is enhanced and substantial economies result from the sharing of resources.

The Graduate School disseminates information concerning external funding opportunities for research, and reviews proposals for such funding to determine their consistency with the research policies of the University. The school provides encouragement for faculty research activities through grants, travel support, symposia support and research fellowships. This money is allocated upon advice of the Research Council, members of which are appointed by the vice provost for research. A portion of the council's funds are reserved for summer research fellowships for faculty. Selection is competitive.

GOVERNANCE OF THE GRADUATE SCHOOL

The Graduate Faculty Senate is the governing body of the graduate faculty. Its members are elected representatives of degree-granting departments and area programs. The senate is organized into six academic sectors: behavioral sciences, biological sciences, humanities, mathematical sciences, physical sciences and social sciences. The sectors review course changes, degree requirements, membership applications, as well as academic policy relevant to specific disciplines. Five standing committees consider general policy matters related to academic affairs, procedures, membership, graduate student appeals and research affairs. An executive committee guides and coordinates the activities of the senate.

Graduate Faculty and Doctoral Faculty: Membership in the graduate faculty requires regular appointment to the rank of assistant professor or above. To supervise doctoral dissertations, a faculty member must be a member of the University Doctoral Faculty. Appointment to the doctoral faculty is for a five-year term.

Director of Graduate Studies: Each department offering a graduate program selects a faculty member to serve as director of graduate studies. The role of the director is to facilitate communication between the Graduate School, students and faculty; to provide advice to students on Graduate School, departmental and University regulations; and to assure that these regulations are applied uniformly in the program.

Administration: The Graduate School is headed by the graduate dean. The dean administers activities related to academic programs, recruitment and marketing, graduate admissions, fellowships and support services including the acquisi-

Graduate Degrees (Information on each program can be found in the Fields of Study section beginning on page 29.)

Accountancy (M Acc, PhD)
Agricultural Economics (MS, PhD)
Agronomy (MS, PhD)
Ancient Studies (Graduate Minor)
Animal Sciences (MS, PhD)
Anthropology (MA, PhD)
Art (MFA)
Art History and Archaeology (MA, PhD)
Biochemistry (MS, PhD)
Biological Engineering (MS, PhD)
Biological Sciences (MA, PhD)
Biomedical Sciences-Veterinary Medicine (MS)
Black Studies (Graduate Minor)
Business Administration (MBA, PhD)
Chemical Engineering (MS, PhD)
Chemistry (MS, PhD)
Civil Engineering (MS, PhD)
Classical Languages (MA)
Classical Studies (PhD)
Communication (MA, PhD)
Communication Science and Disorders (MHS)
Computer Engineering (MS)
Computer Science (MS)
Computer Engineering and Computer Science (PhD)
Consumer and Family Economics (MS, PhD)
Curriculum and Instruction (MA, M Ed, EdSp, EdD, PhD)
Dispute Resolution (LLM)
Economics (MA, PhD)
Educational and Counseling Psychology (MA, M Ed, EdSp, PhD)
Educational Leadership and Policy Analysis (MA, M Ed, EdSp, EdD, PhD)
Electrical Engineering (MS, PhD)
Engineering (ME)
English (MA, PhD)
Entomology (MS, PhD)
Environmental Design (MA, MS, PhD)
Exercise Physiology (MA, PhD)
Fisheries and Wildlife (MS, PhD)
Food Science (MS, PhD)
Forestry (MS, PhD)
French (MA)
Genetics Area Program (PhD)
Geography (MA)
Geology (MS, PhD)
German (MA)
Gerontology (Graduate Minor)
Health Administration (MHA)
Health Informatics (MS)
Historic Preservation (Graduate Minor)
History (MA, PhD)
Horticulture (MS, PhD)
Human Development and Family Studies (MA, MS, PhD)
Human Environmental Sciences (PhD)
Human Nutrition, Foods and Food Systems Management (MS, PhD)
Industrial Engineering (MS, PhD)
Information Science and Learning Technologies (MA, M Ed, PhD)
Linguistics (Graduate Minor)
International Development (Graduate Minor)
Journalism (MA, PhD)
Materials Science (Graduate Minor)
Mathematics (MA, MST, PhD)
Mathematics-Applied (MS)
Mechanical and Aerospace Engineering (MS, PhD)
Medieval and Renaissance Studies (Graduate Minor)
Microbiology-Medicine (MS, PhD)
Museum Studies (Graduate Minor)
Music (MA, MM)
Nuclear Engineering (MS, PhD)
Nursing (MS, ND, PhD)
Nutrition Area Program (MS, PhD)
Parks, Recreation and Tourism (MS)
Pathobiology Area Program-Veterinary Medicine (PhD)
Pathology (MS)
Pharmacology (MS, PhD)
Philosophy (MA, PhD)
Physical Therapy (MPT)
Physics (MS, PhD)
Physiology-Medicine (MS, PhD)
Physiology Area Program-Veterinary Medicine (Phd)
Plant Pathology (MS, PhD)
Political Science (MA, PhD)
Practical Arts and Vocational-Technical Education (M Ed, EdSp, EdD, PhD)
Psychological Statistics and Methods (Graduate Minor)
Psychology (MA, MS, PhD)
Public Administration (MPA)
Public Health (Family and Community Medicine) (MS)
Religious Studies (MA)
Romance Languages (PhD)
Rural Sociology (MS, PhD)
Social Work (MSW)
Sociology (MA, PhD)
Soil and Atmospheric Sciences (MS, PhD)
South Asia Language and Area Studies (Graduate Minor)
Spanish (MA)
Special Education (MA, M Ed, EdSp, EdD, PhD)
Statistics (MA, PhD and Graduate Minor)
Textile and Apparel Management (MA, MS, PhD)
Theatre (MA, PhD)

tion of external grants and contracts to support graduate student education.

General Procedures

APPLICATION PROCESS: The University of Missouri-Columbia has a decentralized graduate admissions process for U.S. citizens and permanent residents. If applying for a specific degree program, an applicant should have all required application materials sent directly to the department. These materials include: completed MU graduate application form, application fee, official transcripts from all universities and colleges attended, official scores of required test (GRE, MAT, GMAT), departmental application form (if required), statement of purpose (if required), and letters of recommendation. Photocopied test scores are not acceptable, but official test scores received by students from the testing service are acceptable. It is best, however, to have official test scores sent to the department.

Graduate School application forms may be obtained from the department or the Graduate School, 210 Jesse Hall, Columbia, MO 65211 or on the web at www.missouri.edu/~gradschl. Application materials may also be requested by calling (573) 882-6311, or toll-free 1-800-877-6312.

Note: Current MU undergraduate students, former MU graduate students, nondegree applicants and international students should refer to special requirements explained later in the General Procedures section. Former MU undergraduate students should follow the regular graduate application procedures outlined above.

GRE TEST SCORES: All graduate students are required to submit, as part of their application materials, the general test scores of the GRE, or scores from an appropriate alternative nationally normed test. (Under extraordinary circumstances, the director of graduate studies may request and the graduate dean may grant a waiver.)

Students who are applying to a doctoral program and who have earned a master's degree may, at the discretion of the admitting department, present scores more than five years old. Students who do not have a master's degree must present scores that do not exceed five years. GRE score reporting policies have been adopted by the GRE Board relative to keeping and reporting GRE scores earned during the five-year period before the beginning of the current testing year. Current GRE Board policy, in effect since October 1985, states that scores are reportable for five years.

When registering for the GRE, be sure to designate the University of Missouri-Columbia as an institution and the department code so that scores will be sent to the department as well as the University. When scheduling a date to take the test, allow enough time for test scores to be included in the application materials.

Pencil-and-paper test dates for the GRE are being eliminated and replaced by computer-based testing. Contact your campus testing center for more information or write to the Educational Testing Service, P.O. Box 6000, Princeton, N.J. 08541-6000.

CURRENT MU UNDERGRADUATE STUDENTS: Students who are currently undergraduates at MU do not need to fill out a Graduate School application form. Current undergraduate students should submit a Transfer of Division form, available from Admissions, 230 Jesse Hall, Columbia, MO 65211, (573) 882-7786. Students also must complete any required departmental application form/process. Consult with the department of interest to learn the deadline for applying to its graduate degree program. Also, students need to submit official transcripts from institutions attended (other than MU) and graduate exam test results before the department's deadline. Write or call the departmental director of graduate studies for details.

FORMER MU GRADUATE STUDENTS: Students who have previously attended MU as graduate students need not fill out a Graduate School application form. Former graduate students must submit a Request to Re-enroll form, available from the Graduate School or from Admissions, 230 Jesse Hall, Columbia, MO 65211, (573) 882-7786. Students also must complete any required departmental application form/process. Consult with the department of interest to learn the deadline for applying to its graduate degree program. Also, students must submit official transcripts from institutions attended (other than MU) and test results (if not already on record) before the department's deadline. Write or call the departmental director of graduate studies for details. **Note: Former MU *undergraduate* students must submit the regular Graduate School application form along with the application fee and other supporting materials.**

INTERNATIONAL STUDENTS: For information concerning admission, estimated expenses and the international student application form, prospective students who are not citizens or permanent residents of the United States should write the Office of International Admissions, 230 Jesse Hall, Columbia, MO 65211, at least one year before the desired date of admission. Students also should contact the department of interest for any departmental application forms/information.

Students from countries where English is not the native language must take the Test of English as a Foreign Language (TOEFL) given by the Educational Testing Service, Princeton, N.J. 08540. The test should be taken six to nine months before the academic session in which the student expects to enroll. Each department establishes its own TOEFL score requirement.

VETERANS: The Office of Veterans Services, 230 Jesse Hall, Columbia, MO 65211, provides G.I. Bill information and certification for eligible veterans, dependents and vocational rehabilitation veterans. The office also furnishes information on military service educational assistance programs. For more information, call (573) 882-3852.

APPLICATION DEADLINES: Deadlines vary. Write or call the departmental director of graduate studies for specific deadline dates.

Admission

General admission and degree requirements for graduate students are determined by the graduate faculty through its representatives on the Graduate Faculty Senate. Departments and area programs establish admission standards that, in many cases, exceed the minimum requirements of the Graduate School. The departments and area programs are listed alphabetically in the **Fields of Study** section beginning on page 29.

ADMISSION TO GRADUATE SCHOOL is based primarily on three criteria:

- An official transcript verifying that the applicant has earned a baccalaureate, DVM, MD or JD degree equivalent to that granted by MU.
- A grade point average of B or better in the last 60 hours of undergraduate education for applicants with less than a master's degree.
- Official results of the GRE or other required test.

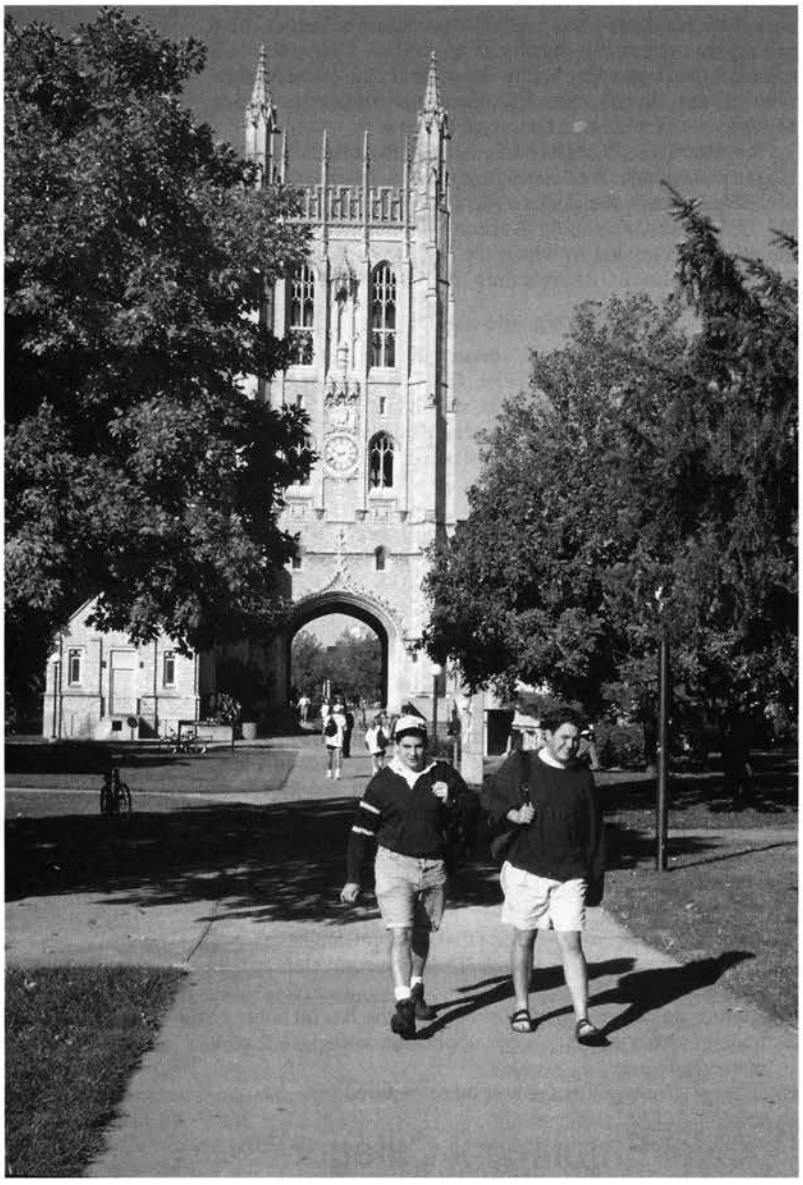
Special Enrollment Categories

NONDEGREE GRADUATE STUDENTS: The Nondegree Graduate Student Program allows students to prepare for admission to a graduate degree program either at MU or elsewhere. Some may wish to explore a new discipline, to take courses for career advancement, or simply to seek personal enrichment experiences. A nondegree graduate student has access to MU libraries, laboratories, museums, and recreational

and athletic facilities. Some departments may restrict the availability of their courses to nondegree graduate students.

The Nondegree Graduate Student Program is administered by the Graduate School. The nondegree graduate student may take undergraduate- or graduate-level courses, but does not earn credit toward a graduate degree. Up to 12 hours of graduate credit taken as a nondegree graduate student may be applied to a graduate degree program upon approval of a department if the student is accepted to a degree program.

Applicants who hold a baccalaureate degree or its equivalent from a U.S. university or a university in which instruction is in the English language may be admitted to MU as nondegree graduate students by the graduate dean. International students residing in the United States who do not satisfy this requirement and are seeking admission as nondegree graduate students must provide evidence of proficiency in English. Either a minimum score of 530 on the Test of English as a Foreign Language (TOEFL) or a minimum of 24 semester credit hours in which the student maintains a 2.0 GPA (A=4.0) in a degree program in which English was the primary language is required. The University of Missouri-Columbia **will not** issue I-20s to international students so that they may enter the United States to become nondegree graduate students.



The Memorial Union tower and north and south wings were constructed over a 75-year period. Renovated in 1996-1997, the Memorial Union has been revitalized as the true student union on campus. Amenities include a large lounge area, food court, meeting and banquet facilities and a chapel. The International Center also has its offices here.

Applicants must submit the MU graduate application form, pay the graduate application fee, have an official transcript sent to the Graduate School, and pay graduate educational and graduate student activities fees. No GRE test scores are required for nondegree graduate students.

Financial aid is not available to nondegree graduate students. They cannot be awarded a teaching or research assistantship, and they do not qualify for waivers of educational fees.

The nondegree graduate student who wants to earn a graduate degree must submit official scores on an appropriate graduate admission examination (GRE, GMAT, MAT), meet Graduate School admission requirements, and apply directly to the degree program of interest using a Change of Degree Program form. At the discretion of a department or area program, up to 12 hours of graduate-level courses completed while a nondegree graduate student with a grade of B or better may be applied toward a graduate degree in that department or area program.

Nondegree graduate students must maintain a 3.0 GPA. If a nondegree graduate student's cumulative GPA is less than 3.0, the student will be given one automatic probationary semester. If, after one semester of probation, the student's cumulative GPA does not reach 3.0, the student may be granted a second probationary semester following a successful written petition made directly to the dean of the Graduate School. (Summer sessions are not counted as probationary semesters.) If the student fails to achieve a cumulative GPA of 3.0 following the second probationary semester, the student will be made ineligible to enroll as a nondegree or degree-seeking graduate student.

If at any time a student's term or cumulative GPA falls below 2.0, the student will be ineligible to enroll as a nondegree or degree-seeking graduate student.

SENIOR DUAL ENROLLMENT: With the approval of the divisional and graduate deans, seniors who rank in the upper half of their class, have a B average in the most recent 45 semester hours of credit and are within 15 hours of completing graduation requirements, may dually enroll as an undergraduate for up to six semester hours of graduate credit. Consult with divisional deans for information about exceptions to these rules for honors students. Dual enrollment must be completed and approved by the Graduate School within one month after the start of the fall and winter semesters, and within three weeks after the start of the summer session. This program also is available to seniors in other Missouri colleges. Additional information may be obtained from the Graduate School.

UM TRAVELING SCHOLARS is designed to provide breadth and depth in the opportunities for graduate study offered at the four campuses in the University of Missouri System. It permits advanced graduate students at any one of the UM campuses to enroll in courses that are not available on their home campuses. Enrollment at the host campus is normally limited to no more than one or two courses a semester. Only students in good standing who have been admitted to a graduate degree program on the home campus may participate. Courses completed at the host campus must be applicable toward requirements for the degree sought by the student at the home campus as transfer credit. Credit earned as a UM Traveling Scholar cannot be used to satisfy the master's or educational specialist degree residency requirement. The student's adviser initiates the student's enrollment proposal by contacting the appropriate professor at the campus where the student wishes to study. Approval of the respective graduate dean is required. When participating in the program, the student will register for the appropriate number of hours and pay fees at the home campus.

Fees

All fee statements are announcements only and are not to be regarded as offers to contract. MU reserves the right to change any and all fees at any time.

APPLICATION FEE: All new students are required to submit a fee with their application form. This nonrefundable fee is as follows:

- United States Citizen, $25.
- International Students, $50. (The fee for international students is based on the higher cost of processing these applications.)

MISSOURI RESIDENT AND NON-RESIDENT EDUCATIONAL FEES: For 1999-2000, the educational fees are $167.80 a credit hour for Missouri residents and $504.80 a credit hour for nonresidents. Additionally, all students pay the Student Activities Fee and Instructional Computing Fee. The Student Health Fee is applied to all full-time students (see below).

Please refer to the **Financial Support** section beginning on page 14 for information on fellowships, scholarships, assistantships and loans.

A student who is a full-time staff member at MU or is the unmarried minor child or the spouse of such a staff member pays Missouri resident educational fees.

Any person who has been a resident of Missouri for at least one year before registration qualifies for resident educational fees. For details see the brochure *Residence and Educational Fee Assessment Rules*, available from Residency/Admissions, 230 Jesse Hall.

Each student is responsible for registering under the proper residence and paying the proper fees.

STUDENT ACTIVITIES FEE: Students registered for resident work on campus are required to pay a student activities fee of $9.75 per credit hour as of 1999-2000, with a maximum of $117.02 during regular semesters and $58.50 during the summer session.

This $117.02 student activities fee is allocated to the following areas: student union, student life, capital improvement, student government, student organizations, divisional student council-grad, intramural program, ASUM, Hearnes Center, transportation, recreation administration and the recreation facilities and fields, and the parking garage.

INSTRUCTIONAL COMPUTING FEE: $8.30 per credit hour.

STUDENT HEALTH FEE: The $60.00-per-semester fee is required for full-time students. This covers routine primary care, urgent care, on-site laboratory and X-ray studies, and routine immunizations through the Student Health Center. Part-time students have the option of paying this fee.

SUPPLEMENTAL FEES:
College of Engineering: $35.70 per credit hour.
School of Journalism: $25.40 per credit hour.
School of Nursing: $106.20 per clinical credit hour.

MISCELLANEOUS FEES:
Applied Music Fee: $127.50.
Hood Fee: Those granted PhD or EdD degrees may purchase hoods for $35.
Transcript Fee: An on-campus adviser copy is free. Picked up student copy is $4; official copy that is mailed is $5. Faxed domestic transcripts fee is $10; international fee is $15.
Dissertation Microfilming Fee: $55
Diplomas held for delinquent indebtedness: A student is required to clear all delinquent indebtedness to the University before a diploma may be released or a transcript issued.

Laboratory Breakages: Breakage or loss of laboratory equipment due to personal negligence on the part of the student is assessed against the student when the actual value of the supplies exceeds $1. The amount of this charge is determined by the head of the department.

REFUND OF FEES: If a student leaves the University or drops a course, a formal request must be filed with the Graduate School. Refunds will be paid, with some exceptions, according to the *Schedule of Courses*. Deductions may be made from the refund for any money students owe the University.

A LATE REGISTRATION FEE: Is charged if students do not complete registration by the last day of regular registration. As of 1999-2000 the late fee is $132.60.

TIME AND METHOD OF PAYMENT: Arrangement for the payment of all University fees must be made at the time of registration as a condition of admission to classes. Students who preregister must arrange payment by the announced deadline or the advance registration will be canceled and the student will be required to register again. Enrollment is not complete until arrangements have been made for payment of fees.

The student may choose one of the following methods of payment:

- Payment in full by due date.
- Minimum payment plan—please note that choosing the minimum payment results in 1% finance charge per month.
- Enrollment based on financial aid.

Write or call the Cashier's Office, 15 Jesse Hall, (573) 882-3097, for information on the above methods of fee payment.

Personal checks for payment of fees or other obligations to the University will be accepted only when the amount of the check does not exceed the amount due. A service charge of $15 will be assessed on each check returned unpaid.

A student presenting a check to the University as payment for the educational fee (which is returned unpaid and remains unpaid after the close of the regular registration period), shall be considered a late registrant and shall be subject to the late registration fee in addition to the bad check charge.

Credit Cards: Discover, MasterCard and VISA are accepted toward payment of fees.

FULL-TIME EMPLOYEES of the University should check with their supervisors or the Graduate School for information on educational benefits.

INTERSTATE RECIPROCITY AGREEMENT: By joint agreement of the Board of Curators of the University of Missouri System and the Board of Regents of the University of Nebraska, qualified Missouri residents may enroll in certain programs in Nebraska and be charged at the rate paid by Nebraska resident students. Conversely, qualified Nebraska resident students may enroll in certain programs on one of the campuses in the UM System and be charged fees at the rate paid by Missouri resident students. For further information regarding this agreement contact the Admissions Office, 230 Jesse Hall, Columbia, MO 65211, (573) 882-3852.

Academic Regulations

STUDENT RESPONSIBILITY: It is each graduate student's responsibility to be familiar with the information presented in this catalog, and to know and observe all regulations and procedures relating to the program he/she is pursuing. In no case will a regulation be waived or an exception be granted because students plead ignorance of, or contend that they were not informed of, the regulations and procedures. Responsibility for following all policies and meeting all requirements and dead-

lines for graduate programs rests with the student.

ACADEMIC HONESTY AND PROFESSIONAL ETHICS: Academic honesty is essential to the intellectual life of the University. Students who pass off as their own the answers, words, ideas or research findings of another person are guilty of academic dishonesty. In addition to such acts of cheating or plagiarism, any unauthorized possession of examinations, hiding of source materials, or tampering with grade records are acts of academic dishonesty specifically forbidden by University rules.

According to the *MU Faculty Handbook,* faculty are required to report to their departmental chair and the provost's office all acts of academic dishonesty committed by graduate, as well as undergraduate, students. In all such cases, the faculty member should discuss the matter with the student and then make an academic judgment about the student's grade on the work affected by the dishonesty and, where appropriate, the grade for the affected course. The decision as to whether disciplinary proceedings are instituted is made by the provost. Because of the importance of honesty to academic and professional life, acts of dishonesty by graduate students may result in dismissal from the University.

Graduate students also should be aware that most professional associations have codes of ethics. These codes vary considerably across fields, but tend to provide guidelines for a broad array of professional responsibilities including teaching, research and working with clients. Violations of a code of ethics can lead to negative sanctions by one's professional colleagues and the expulsion from the professional associations in one's field. Graduate students are encouraged to obtain copies of codes of ethics for their chosen profession from the director of graduate studies in their department or program.

Master's Degrees

The University confers a variety of master's degrees to students who satisfy the general requirements of the Graduate School and the specific requirements of the degree-granting department or area program.

DEGREE PROGRAM FORMS: By the end of the first year of master's work at MU, a student should begin submitting degree program forms, which will aid the department and the Graduate School in tracking the student's progress toward degree completion. These forms include the following:

- **Program of Study form** — Presents the course work to be included in the student's degree program.
- **Request for Thesis Committee form** — *(for thesis option programs only)* Reports the membership of the student's thesis committee.
- **Report of Master's Examining Committee form** — Reports the results of the thesis defense, master's comprehensive exam, or project presentation.

SELECTION OF AN ADVISER AND PROGRAM OF STUDY: The student selects a consenting adviser from faculty members of the department or area program in which the major work is planned. Before registering for each semester or session, the student consults the adviser concerning a program of courses. After performing satisfactorily for half a semester or for an entire summer session, the student, with the adviser's assistance, completes the Program of Study form that outlines the plan of study for the student's graduate program. The form is forwarded through the departmental or area program director of graduate studies to the Graduate School for approval.

The Program of Study form should be filed with the Graduate School by the end of the student's second semester of enrollment. Upon approval of the program by the Graduate School, the student is a candidate for the degree. If changes must be made on a student's Program of Study form, a Program of Study Substitution form is used.

PROGRAM OF STUDY: The student's program must include a minimum of 30 hours beyond the bachelor's degree (or its equivalent) selected from courses carrying graduate credit. Within these 30 hours, the student must complete a minimum of 24 semester hours in MU graduate courses as approved by the department or area program and the Graduate School. In addition, the minimum 30-hour requirement is subject to the following regulations:

- **Credit for Minor Study:** Two kinds of minors are available. Designated minors consist of nine to 15 hours of course work approved as a graduate minor by a single department or interdisciplinary group and approved by the Graduate Faculty Senate. Designated minors appear by name on a student's plan of study and transcript. Non-designated minors consist of course work selected from one or more departments, providing such course work constitutes a unified program. Non-designated minors must include at least nine hours of course work. These minors appear on a student's program of study, but not on the transcript. Both designated and non-designated minors must be approved by the student's major adviser, the student's departmental chair or director of graduate studies, and the Graduate School. In addition, designated minors must be approved by the chair, program director, or director of graduate studies of the department or interdisciplinary group offering the minor. A listing of designated minors is available in the Graduate School.
- **Independent Study Credit Other Than Correspondence:** Credit for research, problems, special investigations and special readings is limited to a maximum of 40 percent of the credit required for a master's degree.
- **Correspondence Credit:** Although correspondence or extension course credit earned at any other campus is not accepted by the Graduate School, the school will accept up to eight hours of correspondence courses that are authorized for graduate credit and offered by MU's faculty through the UM Center for Independent Study at 136 Clark Hall. Courses to be taken for graduate credit must be approved by the graduate dean, and the enrollment form has a place designated for the graduate dean's signature.
- **Transfer Credit:** A maximum of six hours of graduate credit may be transferred from another university or from another campus of the University of Missouri System upon the recommendation of the adviser, the approval of the departmental or area program director of graduate studies and the Graduate School. For graduate students in the Kansas City Coordinated Engineering Programs only, the requirement for the MS degree shall consist of a minimum of 18 credit hours of course work offered by MU faculty. In addition to the six credit hours of transfer credit normally allowed, a CEP student may use up to six additional credit hours of course work taken at UMKC, provided that in the judgment of the MU graduate committee such courses enhance the quality of the student's program. Before taking course work off the Columbia campus, a student should first consult the adviser.
- **Credit Toward a Second Master's Degree:** A student who has completed one master's degree at the University of Missouri-Columbia or elsewhere may, upon recommendation of the adviser and approval by the departmental or area program director of graduate studies and the Graduate School, present a maximum of eight hours of credit earned in the previous program toward a second master's degree.
- **Dual Master's Degree:** A student may pursue and complete two master's degrees simultaneously at MU by:
  - Satisfying the requirements of the two master's degrees in the participating two programs, schools or departments. These requirements must include at least 15 hours at the 400 level or above in **each** of the degree programs.
  - Completing degree requirements: a thesis or project for

each program, or a shared thesis or project to satisfy the requirements of both programs.

Since both programs must approve the student's planned courses of study, the student is expected to begin the programs at the same time and simultaneously conclude both degree programs.

For more information contact the Graduate School.

DUAL DEGREES FOR MEDICAL STUDENTS: The master's-MD program enables medical students to complete a master's degree while enrolled in medical school. The program allows qualified students to seek in-depth involvement in disciplines of their choice, based upon their future role and earlier background and interests. Master's programs may be pursued in the diverse graduate programs available at MU. Financial support may be provided for the graduate portion of the dual-degree program.

RESIDENCY REQUIREMENT: The faculty of each graduate program determines its own residency requirements for doctoral and master's degrees, subject to initial review by the appropriate sector committee of the Graduate Faculty Senate. Consult your department of study for its requirements.

THESIS: If a thesis is required, it must be the student's own work and must demonstrate a capacity for research and independent thought. A student writing a thesis should obtain a copy of "Guidelines for Preparing Theses and Dissertations" from the Graduate School and a copy of departmental or area program requirements from the departmental or area program director of graduate studies. The following instructions outline the procedure for thesis acceptance:

- The thesis is approved by the major adviser, a second reader from the department and an outside reader who is a member of the graduate faculty from a different MU graduate program. Students need to supply committee members with copies for review/evaluation.
- After successfully defending the thesis, the student will make any needed adjustments in format and corrections/clarifications based on input from the committee.
- A final, unbound original copy of the thesis printed on 25 percent cotton bond paper is submitted to the Graduate School by the established deadline.

Consult the Graduate School, 210 Jesse Hall, Columbia, MO 65211, or (573) 882-6311, for deadline dates and a copy of "Guidelines for Preparing Theses and Dissertations."

GRADUATION REQUIREMENTS: The candidate must have completed all graduate work attempted at MU with a GPA of 3.0 (A=4.0) or better.

Each candidate must pass a final examination to demonstrate mastery of the fundamental principles of the work included in the course of study offered for the degree. If the program includes a minor, the minor adviser will be a member of the final examination committee and will examine the candidate over course work taken in the minor.

Where a thesis is presented in partial fulfillment of graduation requirements, a final examination committee of at least three faculty members is approved by the Graduate School to administer the final examination. Members of the committee, including the third reader of the thesis, may be recommended by the adviser and the department or area program director of graduate studies. No fewer than three members of the committee must sign the report of the master's degree examining committee, which is then forwarded through the departmental or area program director of graduate studies to the Graduate School.

Where no thesis is presented by the candidate, the final examination committee, comprised of three members from the department or area program, is designated by the departmental or area program director of graduate studies with the approval of the Graduate School. Certification of completion of the examination, signed by the director of graduate studies, is forwarded to the Graduate School. All candidates for the MA or MS degrees must complete either a thesis or a substantial independent project which cannot be coauthored.

The candidate must be enrolled at the University during the semester or session in which a thesis is defended, a master's project is presented, or the completion of a master's comprehensive exam is certified.

The program for the master's degree must be completed within a period of eight years beginning with the first semester of enrollment in which the student is accepted to a degree program. Individual departments or area programs may stipulate a shorter time period. Time spent in the armed services will not count toward the eight-year limit. For any extension of this time limitation, the student must petition the Graduate School by submitting a request to the adviser who, in turn, submits a written recommendation to the Graduate School which is endorsed by the departmental or area program director of graduate studies. The Graduate School will notify the adviser in writing of the final decision.

For academic advice or assistance with degree program planning, students should contact their advisers.

Educational Specialist Degree

This degree, offered through the College of Education, is a 30-hour program of specialization built upon the master's degree, of which 24 hours must be taken with MU faculty. A student is required to take a final examination and the report of the results must be approved by a majority of the candidate's advisory committee members and submitted to the Graduate School. A maximum of six semester hours completed with a grade of B or better may be accepted in transfer from institutions accredited to offer doctoral degrees. Off-campus courses authorized for graduate credit and offered by MU faculty members and courses offered through the Center for Independent Study taught by MU faculty may be included in the program. Six semester hours must be completed within one semester or summer session to provide an in-residence experience. Students have eight years to complete the degree from the time they are first admitted to the degree program. Refer to the **Education** section on page 70 for more information.

Doctoral Degrees

The Graduate School grants two types of doctoral degrees — the doctor of philosophy and the doctor of education. To obtain a doctoral degree, a student must follow the general regulations of the Graduate School as well as any special requirements of the department or area program. It is the student's responsibility to make sure all regulations are adhered to and all requirements are satisfied.

An individual who has held, at any time, a regular tenure-track appointment in an MU department is not eligible for a doctoral degree from that department or the area program in which that department participates.

SELECTION OF AN ADVISER: The student selects an adviser, by mutual consent, from doctoral faculty members who are dissertation supervisors in the department or area program in which the major work is planned.

DEGREE PROGRAM FORMS: By the end of the first year of study at MU, a student should begin submitting degree program forms which will aid the department and the Graduate School in tracking the student's progress toward degree completion. These forms include the following:

- **D-1 form** — Verifies the qualifying process and confirms the student's adviser and doctoral committee.
- **D-2 form** — Presents the course work to be included in the student's program of study.
- **D-3 form** — Records the official results of the doctoral

comprehensive examination.
- **D-4 form** — Reports the official results of the dissertation defense.

QUALIFYING EXAMINATION/PROCESS: To be officially admitted to the PhD program, the student must pass a qualifying examination/process. Any department or area program may limit the number of times this examination/process may be attempted.

CREDIT-HOUR REQUIREMENT: MU requires a minimum of 72 semester hours beyond the baccalaureate degree for the PhD and EdD degrees. The student's doctoral program committee must approve all course work used to satisfy the credit-hour requirement and may require additional course work beyond these minimums.

TRANSFER OF CREDIT: The doctoral program committee may recommend that a specific number of hours in a master's degree be transferred toward the total hours required for the doctoral degree, and that additional hours be transferred for continued graduate work done either at MU or elsewhere. The committee may recommend that courses taken through MU's Extension division be counted toward the credit hour requirement. Extension or correspondence course work from institutions other than MU may **not** be used to meet the total hours required for the doctoral degree. On a case-by-case basis, each department decides the number of transfer hours they will request the Graduate School to approve.

CREDIT FOR MINOR STUDY: As is true for the master's degree, the doctoral program may include designated or non-designated minors if these minors are approved by the appropriate faculty members and administrators. For full information, see the description of minor study under **Master's Degrees, Program of Study** on page 8.

DUAL DEGREES FOR MEDICAL STUDENTS: Using the flexibility of the graduate and medical curriculum, students may pursue combined MD/MS or MD/PhD degrees. Students are accepted to the joint program by a single committee. Students interested in this dual-degree program should inquire at the dean's office in the School of Medicine.

The master's-MD program enables medical students to complete a master's degree while enrolled in medical school. The program allows qualified students to seek in-depth involvement in disciplines of their choice, based upon their future role and earlier background and interests. Master's programs may be pursued in the diverse graduate programs available at MU. Financial support may be provided for the graduate portion of the dual-degree program.

The MD-PhD program is for the student seeking a biomedical research career. Additional years are integrated into the medical curriculum to satisfy requirements for the PhD. This is typically accomplished in a post-sophomore and a post-MD period. PhD programs are available in diverse areas at MU. Fellowship support may be provided for the PhD portion of this program, while loan and scholarship funds may be available for the MD curriculum.

RESIDENCY REQUIREMENT: The faculty of each graduate program determines its own residency requirements for doctoral and master's degrees, subject to initial review by the appropriate sector committee of the Graduate Faculty Senate. Consult your department of study for specific residency requirements.

DOCTORAL CANDIDACY AND CONTINUOUS ENROLLMENT: Candidacy for a doctoral degree is established by passing the comprehensive examination. Candidacy is maintained by enrolling in 490/491 Research for two semester hours each fall and winter semester and for one semester hour each summer session up to and including the term in which the dissertation is defended. Continuous enrollment provides access to an adviser's support, doctoral program committee guidance and University research facilities for completion of the dissertation. Failure to continuously enroll in 490/491 Research until the doctoral degree is awarded terminates candidacy.

Candidacy may be reestablished by paying the registration and late fees owed and completing the requirements specified by the student's doctoral program committee. Registration fees owed may not exceed the amount owed for seven terms, regardless of the number of terms beyond seven for which the student failed to continuously enroll. The committee's requirements may include a second comprehensive examination or evidence of currency in the research field as suggested by publications in refereed journals. Candidacy is reestablished when the student's adviser and the departmental, area program or divisional director of graduate studies submits a written request to the Graduate School explaining the basis for the decision. Once approved, a Request to Re-enroll form must be completed and sent to the student's department for processing.

A REASONABLE RATE OF PROGRESS toward the degree is required. The program for the doctoral degree must be completed within five years of passing the comprehensive examination. Candidates who passed their comprehensive exam before Fall 1994 must complete their degree program within eight calendar years beginning with the first semester of enrollment as a doctoral student. Before the expiration of the applicable period, any candidate requiring additional time must submit a request for an extension. On petition of the candidate and the candidate's department, an extension of time may be granted by the Graduate School. Departments specifically reserve the right to recertify currency in the discipline. All requests for extensions should be endorsed by the departmental director of graduate studies and accompanied by a description of the process whereby currency in the discipline is certified, if required by the department.

PhD Degree Regulations

SELECTION OF THE DOCTORAL PROGRAM COMMITTEE: The doctoral program committee must be recommended by the student's adviser and approved by the departmental director of graduate studies and the Graduate School before one year has elapsed following the student's first registration as a doctoral student.

The doctoral program committee shall consist of five faculty: at least three from the doctoral program in which the student is pursuing a degree, and an outside member who is a graduate faculty member from a different MU program. The outside member of a doctoral committee cannot be from outside MU. Persons with specialized expertise may serve on doctoral committees as a fifth or sixth member, with special permission of the graduate dean.

All members of the doctoral program committee will be intimately involved and will actively participate in the activities of the doctoral student at all the stages of the student's career at MU, except the qualifying examination/process. The committee also may participate in the assessment of a student's background and potential for success in the department's doctoral program. Committee members may call a meeting of the full committee at any time to discuss the student's progress.

PLAN OF STUDY: The doctoral program committee approves the student's plan of study, a list of the courses and the credit to be earned in each of them, which will, when completed:
- Prepare the student for research or scholarly investigation in the chosen field of study.
- Satisfy the credit-hour and residency requirement of the department.
- Satisfy any special requirements (proficiency in foreign languages, collateral field, doctoral minor, other special

research skills) imposed by the department or area program.
- Satisfy the Graduate School's requirement for a minimum of 15 hours of course work at the 400 level (exclusive of research, problems and independent study experiences).

The committee also approves, as part of the plan of study, any request for transfer of graduate credit.

In general, a student may establish foreign language proficiency, if it is required, by demonstrating an ability to translate into English two foreign languages; or by demonstrating a high order of fluency in one language, that is, the ability to read, write and converse in that language and to translate that language into English and English into that language.

The student must substantially complete the course work outlined in the plan of study to the satisfaction of the doctoral program committee and the Graduate School before being declared ready for the comprehensive examination.

COMPREHENSIVE EXAMINATION: The student must be enrolled to take this examination. It is not administered unless MU is officially in session.

The comprehensive examination is the most advanced posed by MU. It consists of written and oral sections. It must be completed at least seven months before the final defense of the dissertation. The two sections of the examination must be completed within one month. The written section or sections of the examination may be conducted in one or both of the following two ways: (a) The written sections may be arranged and supervised by the major adviser, in which case questions are prepared and graded by the doctoral program committee; or (b) the major adviser may delegate responsibility for arranging, preparing, supervising and grading the written sections of the examination to one or more departmental/program committees appointed for this purpose.

For the comprehensive examination to be successfully completed, the doctoral program committee must vote to pass the student on the entire examination, both written and oral sections, with no more than one dissenting or abstaining vote. A report of this decision, carrying the signatures of all members of the committee, must be sent to the Graduate School and the student no later than two weeks after the comprehensive examination is terminated. A failure of either the written or oral section of the exam constitutes failure of the comprehensive exam. If a failure is reported, the committee also must include in the report an outline of the general weaknesses or deficiencies of the student's work. The student and the committee members are encouraged to work together to identify steps the student might take to become fully prepared for the next examination. If at any time the student believes that the advice given by the committee is inadequate, the student may send a written request for clarification to the committee. A copy of this request should be sent to the Graduate School as well. The committee must respond to this request in writing within two weeks and a copy filed with the Graduate School.

The student who fails may not take a second comprehensive examination for at least 12 weeks. Failure to pass two comprehensive examinations automatically prevents candidacy.

DISSERTATION: The dissertation must be written on a subject approved by the candidate's doctoral program committee, must embody the results of original and significant investigation and must be the candidate's own work. Every candidate should obtain "Guidelines for Preparing Theses and Dissertations" from the Graduate School and should consult the director of graduate studies for departmental style requirements.

All dissertation defenses shall be open to the general faculty. Departments are encouraged to announce dissertation defense dates to departmental colleagues. The candidate must be enrolled to defend the dissertation, which can only be defended when MU is officially in session. A report of the examination, carrying the signatures of all members of the committee, is sent to the Graduate School before the deadline preceding the anticipated date of graduation. For the dissertation to be successfully defended, the student's doctoral committee must vote to pass the student on the defense with no more than one dissenting or abstaining vote.

The final copy of the dissertation must be submitted to the Graduate School in a form suitable for binding and microfilming. Specific instructions are provided in the "Guidelines for Preparing Theses and Dissertations."

EdD Degree Regulations

A minimum of 72 semester hours of course work beyond the bachelor's degree is required for the degree of doctor of education. The program of study is specifically intended to meet the professional needs of the candidate.

To be admitted, the student must have attained the degree of master of arts with a major in education, a degree of master of education, or the quantitative and qualitative equivalent of one of these degrees, from an accredited college or university.

QUALIFYING EXAMINATION AND PROGRAM OF STUDY: The student's adviser officially recommends for the approval by the Graduate School a doctoral advisory committee of at least five members. In addition to planning the doctoral program with the student, this committee may administer a qualifying examination, which helps to assess the student's general background and potential for the EdD degree. It also guides the planning of the program of study.

If required, the qualifying examination must be successfully completed before the program of study is determined by the adviser and the student in cooperation with the doctoral advisory committee. This program must constitute a well-organized plan of professional specialization in one of the major fields of education, with one or more supporting fields.

COMPREHENSIVE EXAMINATION: As well as pursuing course work in the professional areas of specialization, the student must take courses in educational statistics, advanced educational statistics, methods of educational research and one research elective course. Foreign languages are not required, except as may be determined by the student's doctoral advisory committee.

When the doctoral advisory committee determines that the needed course work has been completed with satisfactory grades, it plans the comprehensive examination (a written and oral examination that includes the candidate's major field of interest) for the degree. This examination must be taken no earlier than the second year of graduate work and be completed at least seven months before graduation. A student must be enrolled to take the comprehensive examination. It is not administered unless MU is officially in session.

For the comprehensive examination to be completed successfully, the committee must vote to pass the student with no more than one dissenting vote. If failure is reported, the committee recommends suggested work or remedial measures. (See Comprehensive Examination under PhD Degree Regulations)

The student who fails may not take a second examination for at least 12 weeks. Failure on two comprehensive examinations automatically prevents candidacy.

DISSERTATION: The dissertation must be reviewed and approved by the doctoral program committee. The same dissertation requirements for the PhD apply to the EdD.

Enrollment Requirements and Registration Procedures

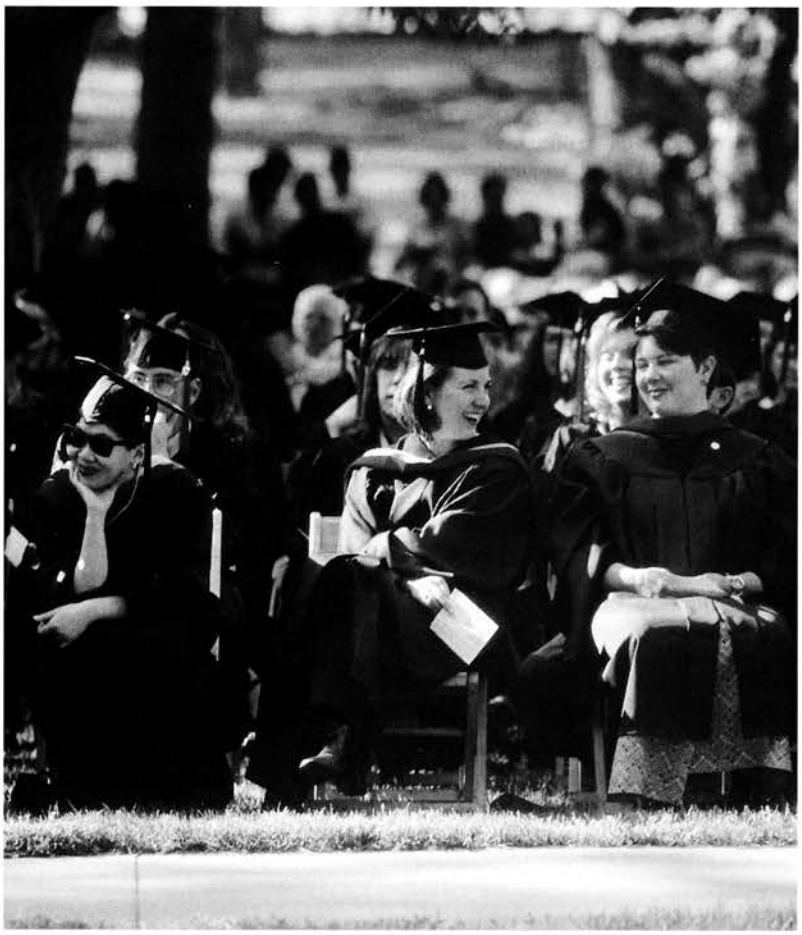
ENROLLMENT REQUIREMENTS AND RESTRICTIONS: Students working toward advanced degrees are required to enroll in the Graduate School for courses that are part of their degree programs. In addition, a graduate student may be required to take undergraduate courses that carry no graduate credit, or enroll in some courses as a hearer. This requirement includes seniors who are enrolled concurrently in an undergraduate college and in the Graduate School who wish to receive graduate credit for part of their programs. Enrollment is expected to reflect the course work and research in which students are engaged.

ENROLLMENT STATUS: Without special permission of the graduate dean, the maximum credit hours in Graduate School is 16 each semester or nine for the summer session. Enrollment in nine hours in the fall and winter and four hours in the summer is considered full-time enrollment for graduate students.

IMMUNIZATION POLICY: Since the fall semester 1986, the Board of Curators has endorsed a mandatory two-dose immunization policy, which states that no person born after 1956 shall attend a University of Missouri campus without documented proof of adequate immunizations. To reduce the potential for measles outbreaks, the MU campus has adopted the Centers for Disease Control (CDC) and Missouri Department of Health recommendation that all newly enrolled college students provide documentation of two doses of measles vaccine to demonstrate adequate measles immunity. The second dose must be the combination measles, mumps and rubella (MMR) vaccine. Examples of acceptable documents include:

Copies of personal immunization records ("baby book").
Copies of physician immunization records.
Copies of school immunization records.

Beginning fall semester 1995, those entering who do not comply with this policy will not be allowed to register the following semester. This policy excludes students matriculating only in off-campus or continuing education/extension courses. Upon presentation of supportive evidence, a waiver for religious or medical reasons may be granted by the Student Health Center. For further information contact the Student Health Center at 882-9109.



In its history, MU's Graduate School has awarded more than 53,185 master's degrees, 10,282 doctoral degrees and 1,068 educational specialist degrees.

REGISTRATION FORMS: New graduate students who qualify for admission and who have paid an application fee are issued registration materials through their departments. Non-degree graduate-level students can obtain their materials from the Graduate School, 210 Jesse Hall. Registration forms for each fall and winter are made automatically for all students enrolled at MU. Registration forms for each summer session also are made automatically for graduate students enrolled for the winter semester or for the previous summer session. Telephone registration is available.

PREREGISTRATION: Enrolled students may complete registration for the upcoming semester during preregistration in October and April. New students may preregister for the fall semester from mid-June to early-July.

PROFESSIONAL ENGINEERING REGISTRATION: The revised statutes of Missouri (Section 327.221) require that "all applicants for registration as a professional engineer in the State of Missouri after Jan. 1, 1977, be a graduate of and hold a degree in engineering in a curriculum accredited by the Accreditation Board for Engineering and Technology (ABET)." All MU and MU/University of Missouri-Kansas City coordinated undergraduate engineering bachelor's-level programs in engineering are so accredited. Applicants who receive advanced degrees in MU's engineering programs but do not have a bachelor's degree in an accredited engineering program are not eligible for registration in Missouri.

Candidates for a graduate degree (MS or PhD) in engineering who want to establish eligibility for registration should consult with their department chair about a program of study that also will lead to a bachelor's degree in an ABET-accredited program. Further information about professional engineering registration may also be obtained from the Missouri Board for Architects, Professional Engineers and Land Surveyors, P.O. Box 184, Jefferson City, MO 65102.

AUDITING COURSES: Students who enroll merely to attend lectures are expected to enroll and pay fees as a "hearer." The status of hearer does not entitle a veteran to a subsistence allowance.

FOR EXAMINATION ONLY: Master's and educational specialist degree candidates who have completed all requirements except the final examination or the defense of the thesis/project, must be enrolled when the final examination is given or the thesis/project is defended. Such students may enroll for "examination only" and pay the required fee. Students who enroll under this rule will not have a valid student ID and thus will not have access to the Student Health Center, the library, the Student Recreation Center or campus computing centers. If a student needs to use any of these services, registration in a one-, two-, or three-hour course (including 490 or 450 research) will result in payment of the required student activity fee which will then allow a student to use such services.

ADDING/DROPPING A COURSE: A student and the adviser must sign an add/drop form. Forms and deadlines are available in the Graduate School, 210 Jesse Hall. Only under extenuating circumstances may a student enter a course after the established deadline, usually two weeks after classes begin for regular semesters.

No grade is assigned to a student who ceases, for any reason, to be a member of a course before the 26th day of a semester, or an equivalent period of time in a summer session. A student who officially drops a course on or after the 26th day and who is doing failing work is assigned the grade F. If the quality of the student's work is not judged to be failing at the time of the drop, the instructor may assign a grade of W (withdraw). Current regulations and time schedules for adding/dropping courses or changing status of enrollment are included in the *Schedule of Courses* each semester or session.

NOTE: If a student is enrolled in only one course and decides to drop that course, the student is withdrawing from MU for that term and will need to submit a Notice of Withdrawal form (see **Withdrawal from the University** below).

WITHDRAWAL FROM THE UNIVERSITY: Formal withdrawal from MU is arranged through the Graduate School using a Notice of Withdrawal form that is signed by the adviser and the dean of the Graduate School.

If the student is making a C or better at withdrawal time, a grade of W is recorded. If the student is making an F at withdrawal time, a grade of F is recorded. Students are responsible for notifying their instructors of their intention to withdraw and for determining if their work qualifies for a W grade. Students who leave MU without filing a statement of formal withdrawal are given a grade of F in all courses. If the reason is so urgent that an official withdrawal cannot be obtained, the student should notify the Graduate School as soon as possible and officially request to be withdrawn.

In computing fees to be paid, courses taken as a hearer will be counted at their normal credit value. Students enrolling in courses for regular credit are required to pay fees according to the number of hours of instruction.

ACTIVE DUTY POLICY: Students who are called to active duty as part of a Reserve or National Guard unit call-up during an academic term and are unable to complete their work have three options:

- They may choose to withdraw from school, in which case they shall be given a 100 percent refund of all academic fees including the educational fee, student activity fee and any instruction-related miscellaneous fees which may have been assessed. In such cases, no course numbers, titles or grades will appear on the student's academic record. All that will appear on the record will be the date of the withdrawal (the date military orders require the individual to report for active duty) with an explanatory statement.
- A student and instructor can consider the use of the "I" grade under appropriate circumstances. The time such students spend on active duty shall not be included in the time allowed for the removal of an "I" grade (i.e. one calendar year from the date of its recording).
- The student and instructor may choose for the student to complete or have completed all of the course work and receive a grade before the date to report for active duty. This arrangement may work if the student is called-up near the end of an academic term and is subject to the approval of the professor.

This policy is implemented to assure that students called to active duty before the end of the semester (or summer term) will receive fair and just treatment, both financially and academically.

Grading and Scholastic Requirements

Graduate students' grades in all courses counting toward an advanced degree are reported as A (4.0) (outstanding); B (3.0) (entirely satisfactory); C (2.0) (acceptable only to a limited extent in fulfilling the requirements for an advanced degree). No D grade may be awarded a graduate student, and a grade of F (0) means the work has not satisfied the minimum requirements of the course. W denotes withdrawn passing and does not affect a student's grade point average. An incomplete grade (I) may be recorded when the student's work is incomplete but otherwise worthy of credit, or when the instructor is unable to assign a grade at the end of the semester. The student must finish this work (400 Problems, 450 Research and 490 Research excepted) within the next calendar year of residence, or the "I" will not be removed.

No graduate credit is given for courses numbered 199 and below. Graduate credit is given for courses at the 200 level if not in the student's major department. Students receive graduate credit for all courses at the 300 level. Courses at the 400 level are primarily for graduate students. Only master's degree students working on a thesis and doctoral students are allowed to enroll in 490 Research. Graduate students enrolled in 200-level courses outside their own departments and in all 300-level courses will be informed no later than the end of the first week of classes if they will be expected to fulfill course requirements beyond those assigned the undergraduate students in those classes.

Graduate students may be graded satisfactory/unsatisfactory (S/U) in graduate-level courses only when those courses are designated as "graded on S/U basis only" in the *Schedule of Courses.*

A graduate student's grade point average is based on the student's entire graduate record at MU. To remain in good standing, a graduate student must maintain a cumulative GPA of 3.0 or better.

At the end of each semester, graduate students with a cumulative GPA below 3.0 are placed on probation. If at the end of the following semester the cumulative GPA is 3.0 or better, the probationary status is removed. A student on probation failing to raise the cumulative GPA to 3.0 may, on the recommendation of the department or area program, be allowed a second and final probationary semester. A student is subject to dismissal upon failure to raise the cumulative GPA to 3.0 by the end of the second probationary semester, or at any time a semester/term or cumulative GPA falls below 2.0.

To graduate, a student must have an overall GPA of 3.0 in all graduate courses taken at MU.

Termination

In addition to dismissal for failure to meet the usual examination and grade requirements, departments and graduate degree-granting area programs have the right to place on probation, and after at least 30 days of probation, to dismiss from their program any graduate student who is deemed to be making insufficient academic progress or whose work is not of the quality required. The faculty adviser or departmental chair must inform the Graduate School as soon as the student is notified and the probationary period begins. The dismissal may occur at any time during a student's work toward a graduate degree. Details of the dismissal policy and appeals process follow.

Dismissal Policy and Appeals Process for Graduate Students

The progress of each graduate student will be evaluated annually by the student's adviser and/or director of graduate studies. The definition of "satisfactory progress" and policies for verifying that satisfactory progress is being made vary among departments, but each department should have a written definition on file in the Graduate School. This policy should be communicated to graduate students during their first semester.

When there is a question as to whether satisfactory progress is being made, the director of graduate studies in the department and/or faculty adviser will write to the student and recommend a face-to-face meeting between the student and the faculty adviser. The Graduate School will be informed of all students who are not making satisfactory progress. If there is disagreement, the faculty adviser should ask the student to submit a separate letter to the director of graduate studies. Copies of both letters should be made available to the student, maintained in a departmental file, and forwarded to the Graduate School.

If difficulties persist and the faculty adviser and director of graduate studies agree that probation is appropriate, the student should be notified in writing of the probationary period, which may vary among departments from 30 days to a full semester. The probation letter should state explicitly that the student is on departmental probation and state precisely what must be accomplished and by what date in order to enable the student to return to good standing in the department and be removed from departmental probation.

If the student does not comply with the conditions of probation, a letter (signed by both the faculty adviser and the director of graduate studies) should be sent to the student (copy to the Graduate School) with notification of dismissal from the degree program. The Graduate School can then send the student an official notice of dismissal from the program.

A student may appeal a dismissal to the Graduate Faculty Senate's Committee on Graduate Student Appeals. This committee may consider issues of due process only. The student shall provide written notification to the graduate dean of his/her intent to appeal within 10 working days of receipt of the departmental dismissal notice. Based on the date written notification of the intent to appeal reaches the office of the graduate dean, the student has 10 working days in which to submit a written appeal. The graduate dean will forward the written appeal to the chair of the Committee on Graduate Student Appeals. Within 90 days of the date an appeal reaches the office of the graduate dean, the Committee on Graduate Student Appeals will complete its review of the appeal. The decision of the committee is binding.

Financial Support

The Graduate School assists graduate students with obtaining financial support through several MU fellowship programs and by providing a free search service and staff assistance to identify and prepare applications to obtain extramural fellowships and grants.

GRADUATE SCHOOL FELLOWSHIPS AND SCHOLARSHIPS: The Graduate School administers several fellowship programs. To receive consideration for any of the following fellowships, students must apply and be accepted to an MU graduate degree program. Applicants must write a letter to their MU department stating their desire to compete for the fellowship, and submit it, along with the following documents, to the MU department:

- A completed MU Graduate School application form.
- A completed departmental application form (if applicable).
- Official undergraduate and graduate transcripts.
- Official GRE scores or other exam scores required by the department.
- Three (3) letters of recommendation, two preferably written by professors familiar with the student's academic ability.
- A 500-word personal statement that includes the student's reasons for pursuing graduate study (personal statement used for departmental application accepted).
- Additional supporting documentation, if any.

The **D.R. Francis Fellowship** competition is open to first-time graduate students accepted to study in the upcoming fall semester, or continuing MU graduate students who plan to study in the area of public affairs or creative literature. In addition to the usual supporting documents required for fellowship consideration, creative literature students must submit an original composition in any language and in any form. The stipend is $5,000 for one academic year of graduate study. A Francis fellow is exempt from resident and non-resident educational fees and is allowed to hold a departmental teaching or research assistantship.

William Gregory Fellowships currently provide $10,000 stipends for new students accepted into a doctoral degree program. The stipend is for one academic year. A Gregory fellow is exempt from resident and non-resident educational fees and is allowed to hold a departmental teaching or research assistantship.

The **Adeline Hoffman Fellowship** provides $10,000 for a new doctoral student. Special consideration is given to those applicants planning to study in the human sciences area (i.e., consumer economics, environmental design, family studies, food and nutrition, human development, and textile and apparel management.) The stipend is for one academic year. A Hoffman fellow is exempt from resident and non-resident educational fees and also may hold a research or teaching assistantship.

The **G. Ellsworth Huggins Graduate Scholarship** is awarded to doctoral candidates in any discipline. The nominee must be a first-time MU graduate student and must not have been enrolled in a MU graduate program within the last three years. Students must be enrolled in a department or area program that offers the PhD for the fall semester in the year in which the award is to be made. Due to stipulations of the award, special consideration is given to students from Barton County, Mo., especially Lamar (Mo.) High School. The Huggins Scholarship provides an annual stipend of $10,000. It is renewable for three additional years for students who make satisfactory progress toward degree completion and maintain a cumulative GPA of 3.5. A Huggins scholar is exempt from resident and non-resident educational fees and also may hold a research or teaching assistantship.

The **Chancellor's Gus T. Ridgel Fellowship for Underrepresented Minority Americans** is awarded to underrepresented, ethnic minority U.S. citizens who are African American, Alaskan Native, Mexican American, Native American or Puerto Rican. The nominee must be a first-time MU graduate student accepted to full-time doctoral study in the fall or a continuing MU graduate student who will begin working toward a higher degree in the fall semester. The Ridgel Fellowship provides an annual stipend of $10,000. It is renewable for three additional years for students who make satisfactory progress toward degree completion and maintain a cumulative GPA of 3.5. A Ridgel fellow is exempt from resident and non-resident educational fees and also may hold a research or teaching assistantship.

SUPPLEMENTAL NEED-BASED PROGRAM: The Graduate School also administers a campus wide supplemental program for new master's and doctoral students.

The **Thurgood Marshall Academic Scholars Program** assists academic departments and area programs in recruiting and retaining graduate students from historically underrepresented ethnic groups who are U.S. citizens (or have written evidence of an application for U.S. citizenship).

The Marshall Program funds are awarded on a competitive

matching basis. That is, departments are expected to provide support to students through teaching/research assistantships or fellowships from departmental or divisional funds (either the regular operating budget or external sources such as research and related grant project funding.) Marshall Program funds also may be made available to departments or divisions for the purpose of increasing the value of a regular assistantship to enhance competitiveness with offers from other institutions.

NOTE: Marshall Program funding is not intended to provide full financial support for any individual. Awards can range from a minimum of $1,000 to a maximum of $8,000. In addition to the award, Marshall Scholars receive the waiver of resident and non-resident educational fees. Funding only applies to first-year graduate students, and departments are expected to provide second and subsequent year funding based upon the student's satisfactory progress toward degree completion. (Under special circumstances a department or division may request an extension of funding. These requests will be considered by the Graduate School on a case-by-case basis.)

Eligibility Requirements: To receive consideration for this program, the student must apply and be accepted to an MU master's or doctoral degree program as a full-time student (minimum nine hours).

Benefit-eligible University employees are not eligible. Academic eligibility criteria shall be determined by each academic department or division in consultation with the Graduate School. These criteria shall be provided to the Graduate School before any nomination is accepted.

Nomination Deadline: There is no nomination deadline. Award decisions are made on a first-come, first-served basis.

MINORITY GRADUATE EDUCATION PROGRAM: The National Science Foundation Minority Graduate Education Program is designed to recruit and train underrepresented minority students as future faculty members in higher education institutions in science, engineering, and mathematics (SEM). This program offers five year fellowships leading to the doctoral degree, with training to prepare fellows to enter the professoriate.

Eligibility: Students eligible to submit applications should meet the following criteria: (a) be a member of an underrepresented minority group (African American, Hispanic American, Native American, Alaskan Native); (b) be a U.S. citizen, national or permanent resident; (c) able to demonstrate a level of financial need; (d) have received a baccalaureate degree in one of the relevant fields, as identified below, with a 3.0 GPA; (on a 4.0 scale) and satisfactory GRE scores; (e) express the desire to earn a doctoral degree and enter the professoriate and (f) be accepted into a doctoral graduate degree program, or enrolled in a graduate degree program with less than 30 accumulated hours towards the doctoral degree, in one of the following SEM fields at the University of Missouri-Columbia: Agricultural Economics, Agronomy, Animal Science, Biochemistry, Biological & Agricultural Engineering, Biological Science, Chemical Engineering, Chemistry, Civil & Environmental Engineering, Computer Engineering & Computer Science, Conservation Biology, Electrical Engineering, Entomology, Fisheries & Wildlife, Food Science & Nutrition, Forestry, Genetics, Geology, Horticulture, Industrial & Manufacturing Engineering, Laboratory Animal Medicine, Mathematics, Mechanical & Aerospace Engineering, Microbiology, Nuclear Engineering, Pathobiology, Physics & Astronomy, Physiology, Plant Pathology, Soil & Atmospheric Sciences, Statistics and Veterinary Biomedical Sciences.

Fellowship Support: MU/NSF MGE Fellows receive the following financial support: Years 1 and 2: $17,000 stipend plus $8,000 for tuition, fees and books per year; Years 3 and 4: $18,000 (TA/RA assistantship + fellowship), tuition/fee waivers, per year; and Year 5: $18,000 dissertation year stipend, tuition/fee waivers, for one year.

DEPARTMENTAL FELLOWSHIPS AND SCHOLARSHIPS: Departments administer many fellowships, scholarships, prizes, traineeships and other financial assistance for graduate students. For information concerning these programs, write directly to the departmental chair or director of graduate studies.

SELECT FEDERAL AND STATE FUNDING: MU has on occasion received funding from several federal and state agencies. Contact the Graduate School office at (573) 882-6311 or 1-800-877-6312 to find out about funding opportunities.

CURATORS GRANT-IN-AID (GIA) AWARDS FOR INTERNATIONAL GRADUATE STUDENTS are limited in number and are open to campuswide competition. GIAs pay for nine credit hours of the graduate educational fee for one semester. They do not cover the student activity fee, computing fee or student health fee. GIA's do not cover educational fees for summer sessions. To be considered for fall semester, an application must be received by April 1.

For application forms and detailed information write or call the International Center, N52 Memorial Union, Columbia, MO 65211, (573)882-6007, or visit the web site at www.missouri.edu/~icweb/.

ASSISTANTSHIPS: Approximately 1,800 graduate teaching and research assistantships in various departments and area programs are available to graduate students. For the academic year 1999-2000, stipends for quarter-time, nine-month appointments are expected to be at least $4,000.

If a student has at least a quarter-time assistantship, he or she may be eligible for a fee waiver through the Graduate Student Support Program (GSSP). The specific eligibility requirements to receive the GSSP fee waiver are as follows: 1) the student must have at least a quarter-time graduate research or teaching assistantship, a graduate instructorship, or a university-recognized fellowship/scholarship with a value of at least $2,000 per semester, and 2) the student must be in good academic standing in his/her home department. Post-baccalaureate students, non-degree-seeking students, first professional students (in the Schools of Law, Medicine, or Veterinary Medicine), and graduate students on academic probation are not eligible to receive the GSSP fee waiver. Only courses that apply to a degree program as determined by the academic home department of the student will be covered by the GSSP. If there are any questions regarding the GSSP fee waiver, please contact the Graduate School.

Eligibility for a GSSP fee waiver requires appointment to one of the titles listed below along with certain enrollment requirements. These enrollment requirements are determined by departments and generally stipulate an enrollment of 6-9 hours per semester and 1-4 hours during summer session. Post-comp doctoral students are required to maintain continuous enrollment of 2 hours of Research each fall and winter semester and 1 hour of Research each summer session.

A quarter-time appointment (0.25 FTE) requires an average of 10 hours per week. A half-time appointment (0.50 FTE) requires an average of 20 hours per week. Different departments have different expectations for their graduate students. Generally, a student who holds any of the above qualifying titles should expect to put in the number of hours needed to complete a particular task, be it teaching a class or running an experiment. In some instances, a week's work could be less than prescribed for a 0.25 FTE or 0.50 FTE appointment; at other times, it may require more effort. The nature of the particular task will determine the quantity of time required. The goal of an assistantship or fellowship is not just the work accomplished, but also the learning experience and the development of a relationship with one's employer, who could potentially become, in the future, one's colleague. Since this mentorship is not governed by collective bargaining agreements and is not intended to conform to such arrangements, flexibility must be exercised by both the student worker and the mentor/employer. When in-

stances of misuse are perceived, the Graduate Dean shall be informed. All reports of misuse will be investigated and processed in a fair and expeditious manner.

GRADUATE TEACHING ASSISTANT: Teaching responsibilities will generally include any of the following:
- teach one to three three-hour classes
- teach one to two five-hour classes
- lead one to five discussion or laboratory sections of a course
- proctor and grade large lecture exams
- prepare and grade lab exams

GRADUATE RESEARCH ASSISTANT: Research responsibilities will generally include any of the following:
- assist faculty with research activities which vary from providing assistance with proposal development through participating in preparation of research reports for refereed journals
- help students and faculty use microscopes, computers, and other lab equipment
- help solve assigned research and class problems
- possibly teach one class or some lab sections

Faculty investigators use their own criteria for selecting students for graduate research assistantships, and much of that criteria depends on a student's interest and aptitude for assisting with certain research projects.

GRADUATE INSTRUCTOR: Teaching responsibilities will generally include the following:
- responsible for teaching, grading, proctor, and tutoring an assigned class or classes
- no research responsibilities beyond the instructor's own degree program requirements
- a half-time appointment

GRADUATE LIBRARY ASSISTANT: Library Assistant responsibilities will include the following:
- keep library open and staffed to assist users
- catalog new acquisitions
- check out assigned readings
- a half-time appointment

Columbia offers the benefits of a large city — diverse restaurants and shops, cultural and sporting activities — and the friendly atmosphere of a small town. Columbians enjoy outdoor activities, too. The MKT Fitness Trail and the Katy Trail — constructed on former railroad beds — are ideal for hiking, jogging, bicycling and enjoying nature.

FELLOW: Responsibilities for persons designated as fellows are determined by departments and are based on the specific arrangements made on an individual basis. In some cases, teaching responsibilities will be assigned; in other cases, research responsibilities will be assigned.

GRADUATE FELLOW: Responsibilities for those designated as graduate fellows are determined by departments and are based on specific arrangements made on an individual basis. Some departments reserve this title for students whose native language is not English. These first year international students do no direct teaching their first year, but may be involved in providing technical support duties with limited research responsibilities. Other departments may require graduate fellows to teach two or three classes per academic year and to have completed all their course work toward a doctorate.

RESEARCH FELLOW: This title is reserved for post-comp doctoral students who are making satisfactory progress toward the completion of their dissertations.

TEACHING FELLOW: This title is reserved for post-comp doctoral students who are making satisfactory progress toward the completion of their dissertations and teaching at least one course.

Assistantship decisions are made at the department level. For more information about assistantships, contact the chair or director of graduate studies in the department or area program of interest.

NEED-BASED FINANCIAL AID: To apply for need-based financial aid, first complete a Free Application for Federal Student Aid. Most colleges should have this form. To have funds available by the start of the fall semester, mail the application by March 1. Once MU knows how much financial aid a student is eligible to receive, the Financial Aid Office tries to meet the student's need with various aid programs. Need-based aid is awarded using the information supplied on the need analysis form. In addition, some non-need-based loan programs are available to all students.

To be eligible to receive federal financial aid, a student must:
- Be a U.S. citizen, permanent resident, or an eligible noncitizen.
- Enroll at MU in a degree-seeking program. Post-baccalaureate special or unclassified graduate students should call the Financial Aid Office at (573) 882-7506 before applying.
- Make satisfactory progress according to MU standards.
- Not be in default on any federal educational loan.
- Not owe a refund on any federal educational grant.

Special Circumstances: For academic year 1999-2000, financial aid need will be based on 1998 income. If a student's total 1999 income is going to be less than 1998 income, please notify your financial aid adviser in the Financial Aid Office, 11 Jesse Hall, Columbia, MO 65211. Students also may call the toll-free number in Missouri, 1-800-225-6075; out-of-state call (573) 882-7506.

Short-term loans are available to assist students in an emergency. Amounts are determined on an individual basis. Please contact your financial aid adviser for more information. The interest rate is 8 percent and the loan must be repaid by the end of the semester. Allow one week for processing.

Educational Development

THE INTERNATIONAL CENTER focuses on supporting MU's International Mission for the 21st Century. The center provides coordination of undergraduate study abroad, international student advising, international fellowships and special-event programming. The Study Abroad Office offers information and advising on programs throughout the world. Center staff also coordinate applications for Fulbright, DAAD, NSEP

and other fellowships for international graduate study. The center supports International House, a residential learning community in Laws Hall. The Office of International Student and Scholar Services provides comprehensive nonacademic advising (especially regarding non-immigrant status, employment and taxation issues) to MU's international community of 2,000 students, faculty, staff and visiting scholars from 100 countries. The center administers Curators Grant-in-Aid Awards for international graduate students (see listing under **Financial Support**). The center staffs the Council on International Initiatives (Provost), the Global Scholars Program and the International Programming Committee (MSA). MU's Intensive English Program (IEP) and English Language Support Program (ELSP) are administered by the center.
For additional information write or call the International Center, N52 Memorial Union, Columbia, MO 65211, (573)882-6007, or visit the web site at http://www.missouri.edu/~icweb/.

THE MISSOURI REVIEW is a nationally acclaimed literary magazine, publishing fiction, poetry, essays, interviews and special features of literary interest. Those special features include "The Found Text" series of never-before-published work by literary giants of the past, and the "History as Literature" series of diaries, journals and letters of people who lived through events crucial to our history. *Writer's Digest* has called *The Missouri Review* one of the most influential literary magazines in the country, and *Esquire* magazine has called it one of the "Mighty Oaks" in contemporary publishing, among a handful of the highest ranking literary publishers.

English 305 is a hands-on internship course in which students have the opportunity to study and work with the editors in actually creating future issues of the magazine. Students may gain practice in several areas, including manuscript reading and selection, text editing, author solicitation, marketing, and Web publishing.

THE PROGRAM FOR EXCELLENCE IN TEACHING (PET) was established by the provost in 1986 to provide educational support to all MU instructional staff. The overall goal of PET is to enhance the quality of student learning through creative, innovative and effective teaching. Services offered to graduate instructors (GI) and teaching assistants (TA) include:

- The College Teaching Seminar for new GI/TAs in August and January.
- A five-day College Teaching Institute for new International GI/TAs in August.
- TA Handbook on college teaching.
- The PET website containing information on teaching and links to other teaching related sites.
- Mid-semester students feedback forms and small group instructional feedback.
- Teaching consultation, class observation and videotaping.
- A yearlong Graduate Teaching Scholars course for selected GI/TAs.
- Departmental workshops.
- The annual three-day Teaching Renewal Conference offering over 30 concurrent sessions on teaching and learning presented by campus and national experts.
- The Chalkboard, a newsletter on teaching and learning.
- A course entitled "Language and Pedagogy for International Teaching Assistants".
- Spoken English language assessment and instructional development for international TAs.

For more information visit the Program for Excellence in Teaching in the Conley House or at our website at www.missouri.edu/~petwww, call (573) 882-6260 or e-mail us at pet.missouri.edu.

THE MU CAREER CENTER, 110 Noyes Hall, offers a number of walk-in services to help students clarify career plans and prepare for the job search process. Services include: assistance with résumés and cover letters; clarifying career interests through a variety of assessments; and using the Internet to conduct job searches. The center also assists students in locating internships, co-ops, service learning and volunteer positions, and part-time employment. More formal career counseling also is available through the center's Community Career Services Program, a service frequently used by MU graduate students.
For more information call (573) 882-6801 or visit the Career Center web site at http://www.missouri.edu/~cppcwww.

The community and students alike enjoy showing their Tiger spirit by participating in MU's homecoming parade. This Tiger tradition is one of many promoting community involvement.

TESTING SERVICES is housed and administered within the MU Counseling Center and offers paper and computer based examinations. Services offered include graduate and professional admissions tests, placement tests, credit-by-examination test, the ACT (scores sent to MU only), licensure and credentialing exams, high school equivalency tests, and other examinations. The Computer Based Testing facility is the Columbia-area location for computer based GRE, GMAT, TOEFL, and other tests offered at convenient individual appointment times year round. Testing Services also administers clinical tests for the Counseling Center.
Testing Services main office is located at 205A Parker Hall, (573) 882-4801. Computer Based Testing is located at 207 Parker Hall, (573) 884-0911.

Housing and Campus Living

Graduate students may reside in any available housing they choose, whether University-operated or off-campus. Students interested in University-operated housing may request information by writing the Department of Residential Life, 125 Jesse Hall, Columbia, MO 65211 or visit the web site at http://www.missouri.edu/~reslfwww/.

Single-student housing applications/brochures are mailed each year beginning in late September and biweekly thereafter to all students who have applied for admission. Brochures and applications for University Student Apartments (for students with families and a limited number of single graduate students) are available throughout the year.

University-owned Residence Halls are available to undergraduate and graduate students. In halls predominantly housing undergraduate students, residents enter into contracts with MU for accommodations on a room-and-board basis for the entire academic year. The 1998-99 rate for one half of a double room and 21 meals a week ranges from $4,243 to $5,053 an academic

year. Payments may be made in installments. Rates vary depending on meal and hall options chosen by the resident student. Most of these halls close during academic recess and break periods.

Graduate and professional students may prefer Cramer Hall, which is designated for them. Cramer Hall is open 12 months a year. Room and board contracts may be canceled without penalty by giving a 30-day written notice. Rooms are furnished for single or double occupancy. A kitchen is on the first floor and small lounges are provided on each floor. IBM PC and Macintosh computers and laser printers connected to the campus mainframe are available in adjacent Pershing Hall.

Manor House apartments also are available to graduate and professional students. At Manor House students have all of the advantages of living on campus with the privacy of an apartment and the convenience of being near downtown Columbia. Rates range from $315 to $475 a month. All apartments are unfurnished except for the stove and refrigerator. Gas, water and sewer are included in the rent. Residents pay for electric, cable TV and telephone services. Contracts may be canceled without penalty by giving a 30-day written notice.

MU also has 320 unfurnished University Student Apartments primarily for students with families and a limited number for single graduate students. Although floor plans vary, all apartments include living room, kitchen, bath and one or two bedrooms. All are unfurnished except for stoves and refrigerators. All utilities are paid by the residents. One-bedroom apartments rent from $275 to $325 a month and two-bedroom apartments from $315 to $365 a month.

Most students find that a trip to Columbia well in advance of the date housing is required will aid them in making more satisfactory arrangements, especially if off-campus housing accommodations are desired.

DINING SERVICES: Campus Dining Services (CDS) operates 16 food service operations on campus including five residential dining halls, Union Square featuring three restaurants and a coffee house, Brady Food Court in Brady Commons, three convenience stores, three Subway® sandwich shops , and four snack bars. With an E.Z. Charge or UPfront account, students can use their MU IDs to pay for purchases in any CDS facility. Meal plans for use in the residential dining facilities are available to all students and may be purchased by the month unless purchased as a part of a residential contract.
For more information call the CDS main office at (573) 882-FOOD (3663).

The Applause Coffeehouse is one of the highlights of the newly renovated Union Square food court. A nearby lounge functions as a study area for students, a programming space for student programs, and a meeting space for large meetings and banquets. The Student Union Programming Board makes its home in the Memorial Union and is a key factor in bringing educational, cultural and social programming to both the Memorial Union and Brady Commons.

PARKING: Parking permits are required for all campus parking areas and may be purchased at Parking and Transportation Services, Turner Avenue Garage, 2nd Level, or call (573) 882-4568.

Limited parking is available to residence hall students wishing to park adjacent to their units. Application should be made to Parking and Transportation Services, Turner Avenue Garage, 2nd Level.

BICYCLE REGULATIONS: All bicycles must be registered. Information about campus bicycle regulations is available at University Police Department, 5 General Services, (573) 882-7201 or check the web side at: www.missouri.edu/~mupdwww.

Student Life

The Department of Student Life is the heart of student activities, leadership development and co-curricular learning. Through its diverse units, professional staff and educational programming, Student Life is a partner with students working to enhance the overall quality of students' lives.

Multicultural Affairs. The Office of Multicultural Affairs and the Black Culture Center plan a diverse calendar of events in cooperation with other university offices and student organizations. Included in all programs are activities that are educational, cultural, recreational and social in nature. The overall mission of these programs is to increase public awareness and understanding of the cultural and historic contribution of domestic minority groups on campus. A037 Brady Commons, 882-7152 or the Black Culture Center, 813 Virginia Ave., 573-882-2664.

Clubs/Organizations and Activities. The Student Life department hosts a network of more than 400 student-run organizations. These opportunities reach a wide spectrum of interests including sports clubs and special interest groups. From religious and service organizations to Graduate Professional Council, student involvement is limited only by the number of hours in the day. Further information on these organizations along with a searchable index can be found on the world wide web at www.students.missouri.edu/~ecc/stuorg.html or at the Center for Student Involvement, A022 Brady Commons, 882-3780.

Women's Center. The Women's Center, 229 Brady Commons, is an educational resource and support center. The Women's Center offers a library, files, periodicals and other information for personal and academic use. The center also conducts programs and workshops on a number of topics (financial planning, self-esteem, parenting, relationships) and offers discussion groups and individual counseling. Graduate students have the opportunity to present programs, volunteer or serve as a graduate assistant.

Rape Education Program. The Rape Education Program, 232 Brady Commons, offers resources on rape and sexual violence for personal, professional or academic use. Books, videos, journal and newspaper articles and educational pamphlets are available as is referral information for services for survivors. The Peer Rape Education program uses two graduate assistants and approximately 25 highly trained volunteers each year to present programs and facilitate discussions for classes, living units and other groups and organizations. The Rape Education Program provides the primary leadership for a campuswide rape education effort throughout the year.

Gay/Lesbian/Bisexual Resource Center. The Gay/Lesbian/Bisexual Resource Center, 230 Brady Commons, offers a wide

range of resources, including books, journal and newspaper articles, videos and information about services and activities. These resources are available to anyone for personal, professional or academic use. The Resource Center coordinates educational discussions for classes and other groups and works with the graduate and professional student gay/lesbian/bisexual organization, as well as with the undergraduate and faculty/staff groups and ally organizations. The center, staffed by student volunteers and graduate assistants, offers a safe space for the gay/lesbian/bisexual community and their allies.

Wellness Resource Center/ADAPT. The Wellness Resource Center (WRC) and ADAPT (Alcohol and Drug Abuse Prevention Team), 34 Brady Commons, provide programs and services that address alcohol and drug abuse issues and other aspects of wellness. The WRC houses a wellness resource library and an extensive peer education program. The WRC also plans proactive outreach programs and services throughout the year.

Greek Life. MU has a strong "greek" tradition with fully 25% of the undergraduate student body going "greek." Fraternities and sororities are social organizations that help provide direction and opportunity for productive citizenship. Greek chapters were founded on three strong traditions of scholarship, leadership, and service. Freshmen will find attaining academic excellence a priority with programs ranging from study and quiet hours to mentoring. Leadership opportunities abound. A for-credit leadership class is offered to "greek" students. Service and philanthropic events are the heart of "greek life." MU "greeks" annually raise $250,000 and give 15,000 hours to community service. Formal rush for both men and women occurs the week before fall classes begin. For more information, call Greek Life at 573-882-8291.

Campus Activities. The Campus Activities Unit, in partnership with the student governments (MSA/GPC) plans entertaining and educational events and programs on campus. Student Activities range from a film series to major concerts and comedians. Festivals and free events are also offered to MU students. Recent events include Adam Sandler, Phish, Coolio, Jars of Clay, Fastball, Bob Costas, Ken Burns and Sheryl Crow. A variety of services are offered as well as a tutorial reference service, activities fairs and an off-campus housing list.

Craft Studio. The MSA/GPC Craft Studio, Darkroom and Brady Commons Gallery, 203 Brady Commons, function as an educational and recreational facility that supports, encourages and promotes the visual arts through a variety of workshops, gallery exhibitions, individual access to studio space, and joint programming with University departments.

Student Legal Services. Student Legal Services attorneys have been helping students help themselves for 24 years by providing free legal consultations. This professional advice, along with related opportunities for education and involvement, is funded through MSA/GPC Student Activity fees. Call (573) 882-3780 for an appointment.

For general information or questions about how you can become involved with the Department of Student Life, please call (573) 882-3621.

GRADUATE STUDENT ASSOCIATION: All graduate students are members of the Graduate Student Association (GSA). At the beginning of each academic year, graduate students are asked to select a fellow student to serve as their voting departmental representative to the GSA General Assembly. The goals of GSA are to promote the interests of graduate students at MU and to serve as a liaison to the faculty and administration.

As a divisional student government, GSA derives funds from the student activities fee. GSA projects include web publication of the Graduate Student Handbook, recognition of graduate students with the Superior Graduate Student Achievement Award and distribution of travel and departmental scholarships to graduate students.

For more information, call the Graduate Student Association at (573) 882-6737, send e-mail to gsawww@showme.missouri.edu or visit the GSA web page at www.missouri.edu/ngsawww/.

GRADUATE PROFESSIONAL COUNCIL: All graduate and professional students are members of the Graduate Professional Council (GPC). Formed in 1982, GPC is the official governing body for students enrolled in the Graduate School, School of Law, School of Medicine and College of Veterinary Medicine. GPC works to inform graduate and professional students about campuswide activities through student department and school representatives and also provides a forum for the students to voice concerns. In order to encourage academics on campus, GPC sponsors several activities each year that give graduate and professional students opportunities to enhance their current academic work such as the Research and Creative Activities Forum, and semiannual opportunities for Travel and Presentation Scholarships. In addition, GPC works extensively in a joint partnership with the Missouri Students Association (MSA), the undergraduate student government, to sponsor and promote academic and social activities.

For more information, call the GPC at (573) 882-3492, send e-mail to gpc@showme.missouri.edu or visit the web site at www.missouri.edu/~gpc/.

THE BLACK CULTURE CENTER: The Black Culture Center exists to create educationally purposeful programs that enhance the intellectual, emotional, physical, social, occupational, and spiritual well being of MU students. While the major emphasis is to promote the understanding and appreciation of the diversity and richness of African American culture, the center also embraces the many culturally diverse heritages represented at the University.

The new Black Culture Center, located at 813 Virginia Ave., is an 11,000 square foot facility that has meeting and conference room space that may be reserved for programs that seek to explore and foster cultural awareness. The BCC also houses a twenty-terminal computer lab that is available to all students, faculty and staff. The BCC is open Monday through Thursday from 8 a.m. to 9 p.m. and Friday 8 a.m. to 5 p.m. Saturday and Sunday hours are noon to 6 p.m. The computer lab is also open Monday through Thursday from 8 a.m. to midnight and Friday 8 a.m. to 5 p.m., Saturday noon to 7 p.m., and Sunday from noon to midnight.

For more information call (573) 882-2664.

DISABILITY SERVICES The Office of Disability Services provides accommodations and support services, within the resources of the University, which will ensure students with disabilities the opportunity to competitively pursue a college education limited only by their abilities, not their disabilities. Services include auxiliary aids and classroom accommodations, testing accommodations, personal assistant referrals and training, and learning disabilities and attention deficit disorder support. In addition, the Office of Disability Services assists other college departments in providing access to services and programs in the most integrated setting possible.

For more information, write the office at AO38 Brady Commons or call (573) 882-4696 or (573) 882-8054.

THE COUNSELING CENTER, 119 Parker Hall, provides free, confidential counseling for individuals with personal, educational or vocational concerns. The Counseling Center is open from 8 a.m. to 5 p.m. each weekday; in the Fall and Winter semesters, the Counseling Center is also open until 8 p.m. on Tuesday and Wednesday evenings. Group counseling, testing services, a stress management clinic, and a self-help center also are available. Call (573) 882-6601 for more information.

Student Services

IDENTIFICATION CARDS: The student ID card can be used for a number of student activities and discounts. These include admittance to the Student Recreation Center and Natatorium and purchase of tickets for athletic events, MSA programs and concerts and University-sponsored concerts and

plays. The ID card serves as a library card and also enables students to use the student health services and the campus computing labs, rent equipment at Wilderness Adventures and cash checks and charge purchases at the University Bookstore. For students living in residence halls, the ID card serves as the meal ticket and allows them to eat at any of the 15 cafeterias and snack bars on campus. Off-campus students can also sign up for a variety of meal plans available through Campus Dining Services.

Students who are enrolling as graduate students, who were previously undergraduate students at MU, do not need to have a new ID card made, nor do they need to have any changes made to their undergraduate ID card. They will retain the same student number, and their graduate status is read electronically from their ID card.

Questions about the use of ID cards should be directed to the coordinator of ID cards at the University Bookstore in Brady Commons.

STUDENT HEALTH CENTER: Access to outpatient medical care is available at the Student Health Center west of the Columns between Francis Quadrangle and Sixth Street. The service, staffed by board certified physicians and nurse practitioners, includes primary and urgent medical care, women's health care, allergy desensitization, X-rays, an onsite laboratory, consultants in dermatology and sports medicine and pharmacy. During fall and winter semesters, hours are 8 a.m. to 6 p.m. on Mondays, Tuesdays and Thursdays; 9 a.m. to 6 p.m. on Wednesdays; 8 a.m. to 5 p.m. on Fridays, and 9 a.m. to 1 p.m. on Saturdays and Sundays. After hours, a registered nurse is available to help assess urgent needs. Call 882-7481.

Full-time students pay a prepaid health fee that covers most services received at the center. Other students pay on a fee-for-service basis or may choose to pay the health fee. A separate student major medical hospitalization insurance is recommended and available through the University.

SUPPLEMENTAL PLAN FOR SICKNESS AND ACCIDENT INSURANCE: This plan, sponsored by the University of Missouri System, may be purchased at a reasonable cost at the time of enrollment. It covers hospitalization and surgery, including medical and surgical treatment while a student is away during weekends, holidays and summer vacations. Insurance to cover a spouse and dependents may be purchased at an extra cost.

Brochures outlining costs and plan coverage are available at the Cashier's Office, 15 Jesse Hall.

REC SERVICES: All Recreation Services programs are designed to provide varying degrees of competitive and noncompetitive, structured and unstructured activities for members of the MU community. Activities include RecSports (men's, women's, co-rec, and faculty/staff divisions for teams and individuals); open or "drop-in" recreation; outdoor recreation; Trips and Travel; lap and recreational swimming at indoor and outdoor pools; and non-credit classes including Club Aerobix, swing dance and Tai Chi.

Both indoor and outdoor facilities and activities are available. The Student Recreation Center (SRC) houses basketball, volleyball and racquetball courts, weight-training equipment, an elevated indoor track, aerobics and combative rooms, and locker rooms. Indoor and outdoor pools are located in a neighboring building, the Natatorium. Rec Services also administers outdoor facilities including playing fields, basketball courts, outdoor track, and fitness areas. A valid MU ID card or SRC facility pass must be presented to enter and use Rec Services' facilities.

For more information, contact the Rec Services Office in 320 Student Recreation Center at (573) 882-2066 or visit our web site at: www.missouri.edu/~recwww.

THE STUDENT PARENT CENTER is an infant through preschool child care facility that provides quality, low-cost care for children of MU's students.

For more information, call 882-4224 or visit our web site at: huey.ustores.missouri.edu/parentcenter/index.html.

THE MISSOURI UNIONS consists of Brady Commons and the Memorial Union. Located in the central part of campus, Brady Commons is "the mall" of the campus and houses many student organizations in the Center for Student Involvement including undergraduate and graduate/professional student governments; the *Maneater,* MU's student newspaper; the Office of Multicultural Affairs; the Office of Student Life including Greek Life; the Access Office for students with disabilities; the Women's Center; and the Gay/Lesbian/Bisexual Resource Center. Brady Commons also is home to the newly renovated games area, T.A. Brady's, which provides bowling, billiards, video games, and a sub shop for students. Brady Commons also features fast-food restaurants, a copy center, a candy and newspaper shop, a hair salon, a craft studio, a bank, the University Bookstore and Computer Spectrum.

Renovated in 1996-97, the Memorial Union has been revitalized as the true student union on campus. Memorial Union has a beautifully-renovated new lounge that functions as a study area for students, a programming space for student programs, and/or a meeting space for large meetings or banquets. It also serves as a meeting place for student organizations, faculty and staff with its many meeting rooms of various sizes. A conferencing program is yet another part of Memorial Union, and staff are available to aid customers in planning the specifics of their events. The Student Union Programming Board also makes its home in the Memorial Union and is a key factor in bringing educational, cultural, and social programming to The Missouri Unions. Finally, Memorial Union welcomes the campus community and visitors to the Union Square food court, the site of Sara Lee Sandwich Shoppe, Hawthorn Homestyle Dining, Romano's Italian Cafe and Applause Coffeehouse. Other highlights of Memorial Union include the reservations/information desk, the International Center and a computer lab.

UNIVERSITY STORES: Located in Brady Commons, the **University Bookstore** provides textbooks, custom publishing/copyright clearance services, Mizzou apparel, school supplies and giftware. In addition, the bookstore offers expanded general reading and art/engineering departments, a UMB Bank, U.S. postal service, and the Mizzou ID/Telecom Center. Graduate teaching assistants are eligible for a 10 percent discount. Call (573) 882-7611 for more information. As part of the University Stores, **Computer Spectrum** is a full service computer reseller offering products at educational prices. For more information, call (573) 882-2131. Located in Blair Hall, the Health Sciences Bookstore provides all health-related course materials, reference books, and supplies. For more information, call (573) 882-9911.

Visit the University Stores web site at www.bookstore.missouri.edu/.

POLICE DEPARTMENT: The University of Missouri Police Department provides a full range of law-enforcement services 24 hours a day, seven days a week to assist in providing students, faculty and staff with a safe and secure environment. Police services can be accessed by calling the Police Communications Center at 882-7201 or contacting any officer on foot or in vehicles during their patrols. Use of the Emergency Red phones, placed at strategic places throughout the campus, will bring an immediate response.

The MU Police Department also provides education and awareness training for members of the University community to help them avoid becoming a victim of crime. A statistical report concerning the amount and intensity of crime at the University is readily available from the department.

The University Lost and Found Department is located in the MU Police Department and can be reached at 882-7207.

The telephone number is (573) 882-7201. Web address is: http://www.missouri.edu/~mupdwww.

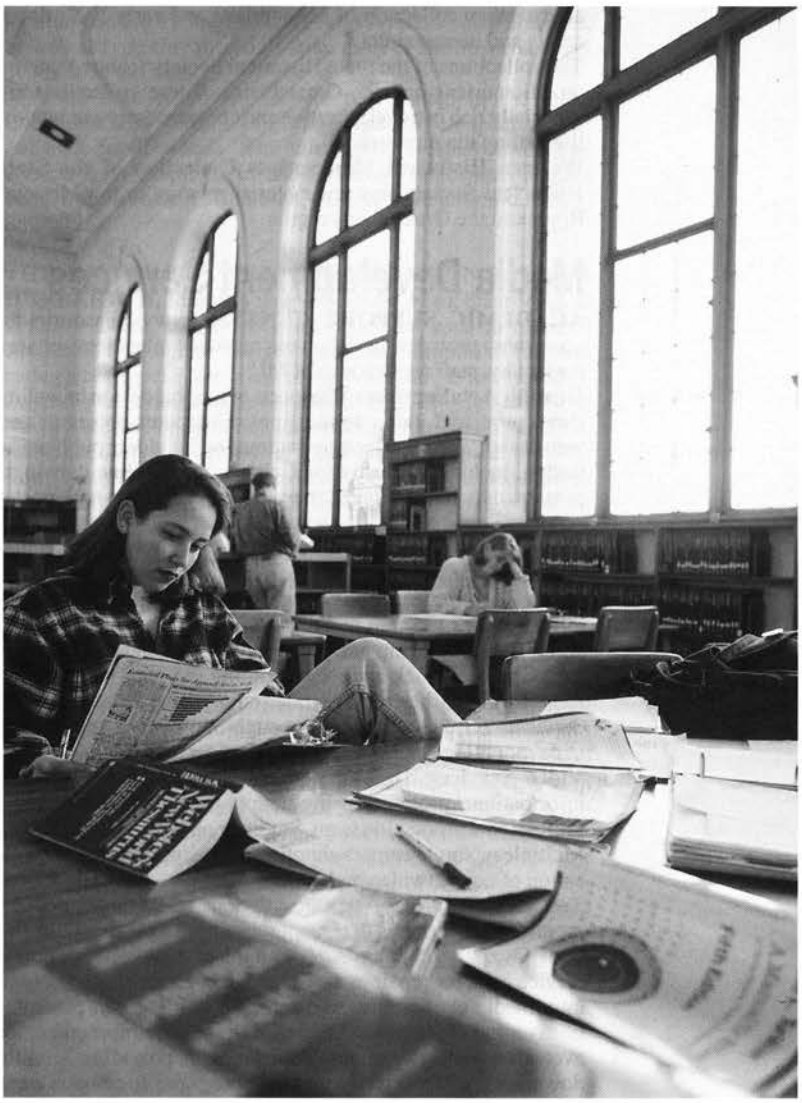
Libraries

The University library system consists of the MU Libraries and the MU Law Library. Included in the MU Libraries are Ellis Library (the main library), the University Archives, and the following six branch libraries: engineering, geology, health sciences, journalism, mathematics and veterinary medicine. The collection of the University libraries includes 2.85 million volumes, 6.46 million microforms, and 23,522 journal subscriptions. Students can receive assistance in Ellis Library at the central reference and information center, the government documents reference center, and Special Collections (including rare books), as well as branch libraries. Other services include the current periodicals reading room, reserve desk, recorded sound collection, and library services for persons with disabilities.
The staff in Ellis Library and in the branch libraries assists students in using the library resources and services and answers questions on specific research problems. Orientation tours and library instruction classes are available to students.

MERLIN (Missouri Education and Research Libraries Information Network) is the online catalog of materials owned by the four-campus libraries of the University of Missouri System and Saint Louis University Libraries. MERLIN also provides a gateway to resources beyond the library catalog including databases, encyclopedias and electronic journals. Some, but not all, of the electronic resources are full-text.
MERLIN terminals are located on the 1st through 4th floors in Ellis Library and in all branch libraries. MERLIN can also be accessed from remote locations. The library catalog is available to anyone via the the Web at merlin.missouri.edu or via telnet to merlin.missouri.edu. If using telnet, you will be prompted for a login. Type **library** (lower case). The libraries' web site (www.missouri.edu/~elliswww) provides access to additional databases and to the web site of branch libraries.
Electronic resources other than the library catalog are available to students, faculty and staff. Some access is available to non-University persons using machines within one of the libraries. MU personnel in need of additional databases not included in the many electronic resources available directly to users should contact a reference librarian. This access involves a fee which is usually subsidized by the Libraries.
Ellis Library and most of the branches maintain photocopy equipment and microform readers and printers. In addition, Ellis Library has typewriters and lockers available for student use.

SPECIAL COLLECTIONS OF THE MU LIBRARIES

Government Documents includes a comprehensive collection of historical and contemporary documents published by the federal government and by the State of Missouri. Publications of selected foreign governments and international organizations are also collected.
Microform Collection includes financial reports from most U.S. corporations, numerous black studies collections, military intelligence and CIA reports, back files of periodicals including early American periodicals. Virtually all American publications before 1820 and most British publications before 1700 are available.
Newspaper Collection contains microfilmed back issues of more than 1,000 newspaper titles, including a large collection of early American titles. A number of current U.S. and foreign-language newspapers are available in the Journalism Library in Walter Williams Hall, and Missouri newspapers are available in the State Historical Society Library.
Rare Book Collection emphasizes titles important in the history of books and printing and contains outstanding examples of specific types of illustrated books. British religious and political history from the sixteenth through the nineteenth centuries, world literature and the arts are also available.
Comic Art Collection houses original cartoons of V.T. Hamlin ("Alley Oop"), Edgar E. Martin ("Boots and Her Buddies"), and Mort Walker ("Beetle Bailey," "Hi and Lois" and others). Also available are underground comic books, reprints of classic comic strips and graphic novels.



The libraries serve the entire University community with a collection of 2.68 million volumes, 5.3 million microforms and nearly 22,742 journal subscriptions. The MU libraries include Ellis Library and its branch libraries in various locations on campus, University Archives, collections in Tate Hall and one library annex.

FREEDOM OF INFORMATION CENTER, in the School of Journalism Library, maintains files on the actions of the government, media and society that affect the movement and content of information. Founded in 1958, and dedicated to the people's right to know, the FOI Center provides reference and referral services.

COLLECTIONS IN THE LAW LIBRARY

The John D. Lawson Library of Criminal Law and Criminology houses about 1,200 books and pamphlets of popular and procedural nature on 19th-century trials.

AUXILIARY LIBRARY COLLECTIONS

Library of the State Historical Society, in Ellis Library, has

an extensive collection of Missouriana and early West documents and memorabilia.

The collections of the State Historical Society feature material on Missourians and the Great Plains. These collections are especially rich in travel narrative and contemporary accounts of life among the pioneers.

Western Historical Manuscripts Collection of the State Historical Society features material relating to the Missouri River and the Great Plains region.

Media Development Services

ACADEMIC SUPPORT CENTER (www.missouri.edu/~ascwww) provides the following media development services for faculty, staff and students at MU:

Graphic Arts Services: All aspects of graphic design including slide, print and video applications. Computer presentations; web design, special effects and animation for video; publication design, including: illustrations, charts, graphs, line drawings, posters, brochures, flyers, newsletters; displays and poster sessions.

Photography: Location and studio photography (35 mm, medium and 4 x 5 formats); client consultation on specialized photo techniques; copy negatives and transparencies; internegatives (35 mm and 4 x 5 formats); custom black and white film processing and proofing (35 mm and medium formats); custom black and white printing (35 mm, medium and large formats); black and white, color and title slides; slide duplication, reduction and text superimposition; and 35 mm slide mounting.

Video Services: Development of creative educational and informational programs using state of the art equipment and a professional production team. Studio or on location production. Multiple or single camera shooting. Non-linear editing. Duplication of current video and audio formats.

Technical Services: Assistance to departments in equipment specification, systems design, purchasing, and system installation. Over the counter A/V equipment repair. On campus service calls for repair or assistance in operating equipment in multimedia classrooms. Assistance in large screen presentations on and off campus. Assistance in sound reinforcement for events on and off campus. Assistance in providing satellite downlink tapings as well as sending programs to campus areas served by the campus cable system. We also provide duplication of video tapes as well as international format playback and conversion to the U.S. standard NTSC 1/2" VHS.

Media Library: A collection of 5,500 video and 5,000 film programs (and a select group of laserdiscs) are available for preview, reference or presentation. Audiovisual and television equipment is available for short-term presentation use.

Learning Laboratory: A support facility for faculty members who wish to augment classroom instruction with audio/video components. Modern language interactive systems, audio listening stations and video review stations are available to students 70 hours a week.

Media Labs: Audio and television production facilities are available to students enrolled in various media courses using the facilities as a part of the course of study. The labs are also available to students, faculty and staff working on video or audio presentations or educational tapes related to MU course work, research documentation, grant applications or training. The labs include two audio studios, a TV studio, five video editing workstations, digital multimedia workstations, camcorders with EFP equipment and a classroom for video presentation on a large screen.

Interactive video classroom and full-motion video conferencing are available for communication with UM campuses, telecommunication community resources centers, and ISDN-linked sites, along with access to the SPRINT MEETING CHANNEL.

Information and Access Technology Services

Information and Access Technology Services (IAT Services), formerly Campus Computing and Mizzou Telecom, provides and supports access to the computing resources of the University, and access to remote facilities via worldwide computer networks. Students at MU may choose to employ a variety of computing resources best suited to the task at hand.

General access computing sites offer students a wide range of options in reaching electronic learning resources, both locally and via the World Wide Web. Many of these facilities also double as technology classrooms. Twenty-nine computing sites in the residence halls are operated in partnership with Residential Life and nine of 19 residence halls are wired for in-room Ethernet access to MU's high speed data backbone. Electronic mail services and access to a wide variety of supported productivity software completes a student's access to the latest in computing technology resources.

MU's host computing environment is provided through machines that perform both administrative and academic functions. Administrative services are largely handled on an IBM MVS mainframe. Academic computing is provided by a wide variety of equipment including a 10-node IBM RS/6000 SP2 cluster. Applications available include a variety of mathematical, statistical, database, and artificial intelligence tools, as well as electronic mail and the campus-wide information system on the World Wide Web at *http://www.missouri.edu/*.

IAT Services operates a state-of-the art fiber-optic data backbone, which connects the host systems, departmental computers, student computing sites, residence hall computing sites, and many individual workstations to each other as well as to state, regional, national, and international networks via the Internet.

Two modem pools offer dial-up access to technology resources for the MU community. TigerLink operates at speeds up to 56kbs and, with a low user-to-modem ratio, offers excellent value, speed, and connectivity. A no-charge modem pool is available to users who do not require either the speed or access offered by TigerLink.

The Adaptive Computing Technology Center is a nationally recognized facility that provides individualized computing assistance to students with disabilities. All computing sites have adjustable tables and any computing site can be outfitted with additional adaptive peripherals or software at the request of students or faculty.

A variety of training opportunities are available to assist students new to the MU computing environment. Courses are offered at no charge to help students learn electronic mail and a wide variety of supported instructional software.

Other services and resources provided by IAT Services include consulting assistance in the computing sites, computer repair and computer warranties, and significant discounts on supported software. Many of these services are available from the IAT Services Outpost located in the Memorial Union, convenient to where many students live and attend class.

Museums and Collections

THE MUSEUM OF ART AND ARCHAEOLOGY is the largest art museum in central Missouri. It exhibits a broad collection of art from prehistoric times to the present. The highly regarded ancient art and archaeology collection includes sculpture, pottery and coins from ancient Egypt, the Near East, Greece and Rome. The Byzantine collection is notable for its gold and silver jewelry, many rare decorative objects and Coptic textiles. Painting, sculptures and graphics from Europe and America represent the main movements in Western art from the 15th century to the present. An important group of South Asian artworks and other objects from China, Japan and Africa, as well as pre-Columbian works from Central and South America,

highlight other world cultures.

As a teaching museum, its more than 13,900 objects provide an excellent opportunity for graduate and undergraduate study. The many artworks and the large amount of material from the University's excavations provide research problems for students of art history and archaeology. A non-circulating library in the museum office is open to students, faculty and the public.

There is a wide range of objects of interest to faculty and students in other fields, such as art, drama, anthropology, classics, history, political science, black studies, women studies and religious studies. MU classes routinely visit the museum in order to complete special projects and assignments. A graduate minor in Museum Studies, taught in collaboration with the Museum, is offered by the Deparment of Art History and Archaeology.

Frequently changing temporary exhibitions, drawn from the permanent collection or borrowed from other institutions, complement the University's educational mission. The museum publishes an annual bulletin, *MVSE,* which includes articles about objects in the museum written by staff, faculty, graduate students and scholars from outside the University.

The museum is housed in Pickard Hall on the Francis Quadrangle (Ninth Street and University Avenue). For more information call (573) 882-3591 or http://www.research.missouri.edu/museum.

THE MUSEUM OF ANTHROPOLOGY gallery, 100 Swallow Hall, contains collections of Native American archaeological and ethnological materials, as well as anthropological specimens from other areas of the world. The museum produces exhibits representing all fields of anthropology with emphasis on the prehistory and early history of Missouri, as well as North American Indian material culture in general. The museum's staff offers such services as item identification and curation/conservation consultations. The museum also serves as an educational resource for the local community.

For further information, especially concerning tours, call the associate museum curator, Museum of Anthropology, (573) 882-3764.

THE WILBUR R. ENNS ENTOMOLOGY MUSEUM, 3-38 Agriculture Building, contains nearly six million specimens and is the largest university insect collection in the world. The museum is used primarily for research and education. However, a partial collection is on exhibit for visitors between 9 a.m. and 4 p.m. most work days during the year, or by appointment.

The collection is especially strong in aquatic insects, Lepidoptera, Coleoptera and Hemiptera. There also are good collections of larvae, mites and spiders. The museum's director is Robert W. Sites and the curator is Kristin B. Simpson. Call (573) 882-2410 or 882-7894 for information. Tours by appointment only.

GEOLOGY MUSEUM: Among the more than 100,000 specimens in the museum are: the invertebrate collections, which are rich in fossils of Devonian, Mississippian and Pennsylvanian rocks of Missouri and the midcontinent; the vertebrate collections, largely of Pleistocene mammals; the collection of conodonts, the most varied and complete of its kind in the world; the collections of fossil Charophytes, representing all known localities in North America and containing reference material from South America, Europe, Asia and Africa. The paleontologic collections of the Missouri Geological Survey also are located in the museum.

The mineral collections contain one of the most complete aggregates of materials from the famous Crestmore locality in California, many of them in crystal form; one of the finest collections of boron minerals in this country, a fine set of garnets, and many excellent crystals from the lead and zinc mines of southwest and southeast Missouri. Clay mineral collections contain a complete set of APA reference clay minerals, as well as type clay materials from most of the important clay deposits of the world.

More than 1,800 species are represented in the Dana Collection. The DeMuth Collection contains fine specimens of polished fossil woods. The curator of the paleontological collections is James H. Stitt, and the curator of the mineralogical collections is Kevin L. Shelton. For more information call (573) 882-6785.

THE UNIVERSITY OF MISSOURI DUNN-PALMER HERBARIUM, Museum Support Center, Rock Quarry Rd. at Hinkson Creek, is a dried plant collection used in research conducted by students and professionals. Samples of rare and endangered species are maintained and locations are recorded. Teaching materials include a general collection, primarily of North America, but also include material from South America, Australia, Asia and Africa. Tropical and subtropical material from Central America includes nearly 30,000 specimens. Areas of specialization include desert ecology, agrostology and the genera Crataegus, Lupinus and Quercus.

The collection of about 250,000 specimens include flowering plants, conifers, ferns, lichens, mosses and algae. The entire private collection of Ernest J. Palmer, a noted authority in the genera Crataegus and Quercus, is housed here. Curator of the herbarium is Robin C. Kennedy.

FISHERY AND WILDLIFE COLLECTIONS: The School of Natural Resources maintains an extensive teaching and research collection of the vertebrate animals of Missouri and surrounding states. The bird and mammal collections in Anheuser-Busch Natural Resources Building contain more than 7,000 specimens. The Glen Smart waterfowl collection, consisting of more than 300 species of mounted waterfowl of the world, is on display on the first floor of Anheuser-Busch Natural Resources. The fish collection contains nearly 60,000 preserved specimens, including fishes from Missouri and the Midwest, and saltwater fishes from the Atlantic, Pacific and Gulf coasts.

There are a variety of cultural opportunities available to students at the University of Missouri - Columbia. Students can enjoy performances from the music and theatre departments throughout the year. They can also visit several museums and collections housed on the MU campus.

Research Centers and Resources

COLLEGE OF AGRICULTURE RESEARCH FARMS: The Agricultural Experiment Station has a number of facilities that are used to conduct pilot field and systems management experiments under the varying climatic conditions and the natural resources found in Missouri. At MU, the world famous Sanborn Field provides continuous records of the changes occurring since 1888 under various cropping programs.

Nine facilities are operated adjacent to Columbia. These include the Thomas Baskett Wildlife Area, South Farms, Foremost Dairy Farms, Rocheford Turkey Farm, Horticulture and Agroforestry Center, Claypan Research Field (McCredie), Bradford Agronomy Center, Schnabel Arboretum and Demonstration Woods and Hinkson Bottoms. Each of these specialized units accommodates both basic and applied research.

Specialized facilities within the state are available at the following off-campus research centers:

The 1,024-acre **Delta Research Center,** at Portageville, Mo., unites four separate farms: the DeWitt Clinton Lee Farm, the Matilda Cavanaugh Farm, the Margaret Marsh Farm and the Roger Rhodes Farm. Serving seven counties in Missouri's Bootheel region, the Delta Center has become a research facility of national significance. Much of the research conducted at the Delta Center focuses on crop production and management. A government grant along with support from the Missouri Soybean Merchandising Council supports research on the soybean cyst nematode. The program has developed nine new soybean varieties, some with unprecedented resistance to several races of the soybean cyst nematode. The Delta Center also is the location of the University's cotton production research, variety testing, crop production, weed science, plant pathology, entomology and foundation seed programs. Additionally, a cooperative rice research effort is conducted with the University of Arkansas.

The Forage Systems Research Center (Cornett Farm) near Linneus, Mo., was established in 1965 when the University began leasing land from the Cornett family. The 1,200-acre farm was donated in 1981 upon the death of the last Cornett family member.

The primary research objective is the development and evaluation of forage systems for all classes of beef cattle. Researchers conduct grazing studies with cow-calf pairs, weanlings and yearling steers and heifers. The interactions of cattle, plants and soil are necessary in understanding cause/effect relationships in beef/forage systems.

Reproductive efficiency, milk production and live weight gains are indicators of animal performance; while forage establishment, productivity patterns and use and persistence are of agronomic interest. Cornett Farm's international reputation attracts visitors from around the globe each year.

The Thompson Farm is seven miles west of Spickard, in Grundy County. Soils on the farm represent about 7,500 square miles or 4,780,000 acres of the north central region of northern Missouri. Beef cattle reproduction, management and production research compose the keystone of the center's program.

The Greenley Memorial Center at Novelty, Mo., was established when Hortense Greenley leased the 700-acre farm to the University. The major objective of the center is to evaluate efficient, profitable crop production in northern Missouri claypan soils, while emphasizing soil conservation, water quality, and energy efficiency.

Researchers study the benefits of no-till cropping, alternative cropping practices, the effects of new technology and products, variety testing, soil fertility, beef and forage management systems, water quality and the environmental impact of crop production.

The Southwest Missouri Agricultural Research and Education Center at Mount Vernon was established in 1959 through the purchase of an 898-acre site. Soils at the center are representative of many major types found in this region. Because it is in the heart of the dairy and beef producing area of the state, the focus of the center is on forage and livestock research.

Forage grass breeding conducted at the Southwest Center has been instrumental in the development and release of the "endophyte-free" tall fescue varieties—*Missouri 96, Mozark* and *Martin* — as well as an orchardgrass variety — *Justus*. New high-magnesium and high-digestibility fescues are currently being evaluated. Legumes and warm-season grasses are also being developed and tested.

Alternative management strategies and treatments for overcoming fescue toxicosis in beef cattle are being investigated. A research/demonstration dairy is being developed in which dairy cattle will be fed forages, and manure will be managed through a plant filtration system. Land application of agricultural and processing wastes for forage fertility and water quality issues highlight current research efforts.

Horticulture research provides information on production alternatives of fruits and vegetables for both commercial producers and home gardeners. Turf grass evaluation, ornamental grasses and native plant demonstrations, and agroforestry are also important parts of the centers programs.

Established in 1947 with lands that were part of the remainder of grant lands from the Morrill Act of 1862, the **University Forest** contains 160 acres of upland hardwood forest. Current projects include the effects of acid rain, hydrology and oak decline research on forest survival. The 22-building headquarters is used as a regional center for outdoor education. Scientists conducting research at the University Forest have access to the adjoining 7,000-acre University State Forest owned by the Missouri Department of Conservation.

The Horticulture and Agroforestry Research Center (HARC) is a 660-acre facility on the loess-covered bluffs overlooking the Missouri River valley. The center was established in 1953 with assistance from the Missouri State Horticultural Society.

The Agroforestry research program involves a systems approach to agricultural production using multicropping scenarios with nut and lumber species intercropped with forages, grains and some specialty crops. A grazing component is being incorporated. Current research is focused on shade tolerance evaluations of forages, living ground covers, nut tree irrigation, and pine and walnut intercropped with cool- and warm-season forages.

Horticultural research programs involve the production and management of tree fruits, small fruits and ornamentals. Specific research focuses on integrated pest management, high density apple orchard management, small fruit cold hardiness, and environmental monitoring for disease and insect management.

The U.S. National Arboretum Midwest Plant Research and Education Site also is at the center. This cooperative program seeks to evaluate environmental stress tolerance and insect and disease resistance of select plant materials and to introduce new and/or genetically improved plant material that will have potential use in agroforestry and horticultural applications.

The center is also the location of the historic **Thomas Hickman Home** and the **John Hardeman Garden**. Plant collections are in place for evaluations and educational programs. The center is open to the public year-round and guided tours are available.

The 300-acre **Hundley-Whaley Farm** located at Albany, MO was made possible through the donation of Elma Hundley and Lulu Whaley. Demonstration and research projects focus on the best management practices and economics for corn, soybeans and grain sorghum production. The research farm is noted for excellence in pesticide evaluations and comparisons. Projects with a sustainable agriculture orientation are emphasized.

The **Graves Memorial Plots** are located along I-20 in southern Atchison County. The goal is to demonstrate management practices for crop production and evaluate new crop

production practices. Projects include weed control on soybeans and corn; planting rates and dates; comparisons of tillage methods; factors affecting soybean cyst nematodes; seed treatments; fertilizer rates, sources and placement; corn variety tests, and warm-season/cool-season grass comparisons.

Hugo Wurdack donated the 1,200-acre **Wurdack Farm** to the University in the mid-1960s. The main research objective is to demonstrate and study integrated livestock and forage systems; and forestry management practices that are economically viable and environmentally sound for the Ozark region.

THE THOMAS S. BASKETT WILDLIFE RESEARCH AND EDUCATION CENTER is a 2,300-acre area 20 miles southeast of Columbia operated by the School of Natural Resources. The center is primarily an upland, forested area typical of the central hardwoods region. Its large size and proximity to campus make it attractive to researchers looking for an outdoor laboratory. Opportunities exist to conduct investigations on diverse terrestrial, flora and fauna. Recent research activity has emphasized determining habitat requirements of wildlife species. The departments of entomology, forestry, and fisheries and wildlife use the center regularly. Much of the funding support for these activities comes from outside grants. The center also is used to carry out the extension and teaching missions of the School of Natural Resources.

THE GAYLORD LABORATORY is nine miles north of Puxico, Mo., in the Duck Creek Conservation Area. This cooperative venture between the Missouri Department of Conservation and the University focuses on waterbird, wetland, and land use research nationwide. The laboratory lies adjacent to 28,000 acres of state and federal lands that serve as an outstanding outdoor laboratory for research on southern forested wetlands.

THE LOW LEVEL RADIATION LABORATORY, located in the Animal Sciences Center and operated by the Animal Sciences Unit, houses a large whole body liquid scintillation counter. This unique facility, shielded in a large steel chamber, is capable of detecting minute amounts of naturally occurring radiation in animals and humans, as well as detecting very low levels of isotopes that may be administered to a subject on an experimental program. Facilities are available for monitoring human babies, as well as adults and animals ranging in size from small laboratory animals up to 600 kilogram farm animals.

B&PA RESEARCH PROGRAMS: The College of Business and Public Administration's resources for research promote individual and team projects in the areas of regional economic analysis, decision-making processes, judicial and legislative processes, organization and administration, consumer behavior, forecasting, operations analysis, population and manpower studies, urban affairs, and state and local fiscal analysis. The college maintains close relations with University research groups throughout the nation through memberships in the Associated University Bureaus of Business and Economic Research, the National Association of Schools of Public Affairs and Administration, the American Tax Association and disciplinary associations.

The **B&PA Research Center** is a computer-based research support facility of the College of Business and Public Administration at MU. The center provides data and data management services, data analysis, software development, consultation on data applications, statistical analysis and instruction in the use of various data sets and associated retrieval software to University faculty, staff and students; federal, state and local government agencies; private enterprises and the public. In addition, the center maintains a large and varied database of financial, economic and demographic information describing characteristics of the nation, the states and their subdivisions. Major data holdings include: the 1990 Census, Bureau of Economic Analysis Regional Economic Information System, Missouri Economic Information Retrieval System, STAT-USA, Center for Research in Security Prices (CRSP) and COMPUSTAT. Much of these data pertain to Missouri and the Midwest. Technical assistance is available on a contractual basis at cost to research organizations or individual researchers.

The **Financial Research Institute** performs contract research on finance subjects, provides development grants to faculty and students, and disseminates research results through publications, meetings, presentations and symposiums. The institute supports research in all fields, but special emphasis is placed upon topics in financial institutions and markets, and public utility finance and regulation. The web site is at tiger.bpa.missouri.edu/research/institutes/.

The **Center for the Study of Organizational Change** (CSOC) is a research and assistance center formed to help students, businesses, non-profit organizations and government agencies rise to the challenge of changing environments. CSOC produces and supports an interdisciplinary understanding of organizational change. In addition to disseminating knowledge, CSOC champions an innovative curriculum to enable students to become accomplished change agents. CSOC also provides expert assistance to companies, and to public and non-profit organizations in executive and management development, basic and applied research, change management and organizational consultation.

JOURNALISM RESEARCH CENTERS AND FACILITIES: The School of Journalism has a variety of special facilities and resources. Students "learn while doing" and can conduct applied research at the *Columbia Missourian,* a general circulation daily newspaper with full-leased wires of The Associated Press and The New York Times Service; KBIA-FM, an affiliate of National Public Radio with a 100,000-watt stereo signal; and KOMU-TV, an NBC affiliate.

The Journalism Library, State Historical Society of Missouri, the Freedom of Information Center and the national headquarters of Investigative Reporters and Editors provide educational and resource services to students and reporters.

New Directions for News, a think-tank dedicated to increasing the impact, effectiveness, readership and appeal of American newspapers, is a clearinghouse for ideas and a resource for research.

The Service Journalism program focuses on how to effectively provide information to consumers and offers workshops for professionals, covering such topics as health and nutrition, travel, science and minorities coverage.

The Science Journalism Center offers data base searches, a clipping service, abstracts of articles in topic areas and copies of original stories, and serves as a source of referrals for reporters interested in health topics.

The Center for Advanced Social Research provides field research assistance for faculty and students as well as newspaper, magazine, broadcast and advertising firms.

The Stephenson Research Center is the home of advanced academic and professional research.

The Graduate Computing Center, which is part of the journalism school's state-of-the-art computer system, provides data-processing facilities and assistance.

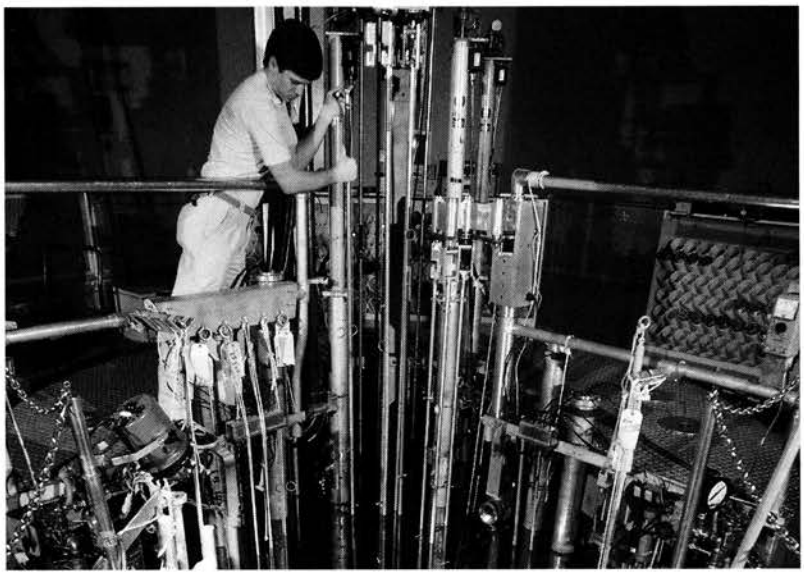
THE CAPSULE PIPELINE RESEARCH CENTER, which began operating in Fall 1991, is the only National Science Foundation-created center in Missouri. The center's mission during its first four years was focused on the development of coal log pipeline technology for transporting coal. The center, during its second four-year term, has broadened its mission to cover pneumatic capsule pipelines for freight transport. Major accomplishments include manufacturing water-resistant and wear-resistant coal logs that either contain no binder or less than 3 percent binder; using trace amounts of a drag-reducing polymer to save pumping energy costs; designing, constructing and successfully testing a coal log compaction machine that can mass produce coal logs; developing a rigorous economic model

to assess the cost-effectiveness of coal log pipelines, and the use of linear induction motor to improve the performance of pneumatic capsule pipeline. Starting 1998, the Center has expanded its research to cover solid waste compaction and construction and testing of a coal log pipeline plant. Future research will also cover use of capsule pipeline for grain transportation.

THE CENTER FOR SURFACE SCIENCE AND PLASMA TECHNOLOGY deals with interfaces, or boundaries, between various materials. Low temperature plasma, the fourth state of matter, is used to create a new interfacial layer via plasma polymerization in interface engineering. In this approach, a "surface" is considered to be an interface with an ambient surrounding. One of the center's goals is to create interfaces which are more stable and more compatible with the surrounding environment than those that occur in nature. One example of the Center's projects is applying such environmentally benign technology to protect aluminum alloys used in aircraft from corrosion without the environmentally hazardous chemicals currently utilized. Other research includes devising improved composite materials for biomedical applications such as orthopedic implants, surface modification of materials to impart improved compatibility with biological systems, development of membranes for various biochemical reactors, and surface modification of particulate matters.

THE POWER ELECTRONICS RESEARCH CENTER (PERC) is supported primarily by Amaren Union Electric Co. in St. Louis. Other funding comes from external grants and contracts. Recent research topics include adjustable-speed AC motor drives; harmonic effects on electric power systems, power line conditioners and harmonic compensation; application of linear induction motors; and modern control strategies including neural networks and fuzzy controls implemented by microprocessors and digital signal processors. PERC is seeking new industry partners and other research grants and contracts in order to continue to provide challenging research experiences for graduate students in the field.

OAK RIDGE ASSOCIATED UNIVERSITIES: Since 1981, MU students and faculty have benefited from its membership in Oak Ridge Associated Universities. ORAU is a consortium of 87 colleges and universities and a management and operating contractor for the U.S. Department of Energy (DOE) in Oak Ridge, Tenn. ORAU works with its member institutions to help their students and faculty gain access to federal research facilities throughout the country; to keep its members informed about opportunities for fellowship, scholarship and research appointments; and to organize research alliances among its members. For information, call the MU Office of Research at (573) 882-9500 or visit the ORAU web site at www.orau.gov.



The Research Reactor Center promotes basic and applied research in neutron-related science and engineering, provides an educational opportunity for students, and supplies radiation and isotope production services for public and private uses.

THE UNIVERSITY OF MISSOURI RESEARCH REACTOR CENTER (MURR) is a multidisciplinary research, service and education center that affords opportunities in the neutron-related sciences and engineering that are unmatched at any other U.S. university. The Center reports to the Office of the Provost. The core resource of the Center is a 10 megawatt (MW) light water moderated reactor that is the highest power university research reactor in this country. This reactor provides unparalleled opportunities for producing radioisotopes, performing activation analysis and conducting neutron beam research. It has a 152-hour-a-week planned operating schedule at 10 MW. With this operating schedule, it produces more neutrons per year than all other U.S. university reactors combined.

The Research Reactor Center has a fundamental mission of service to the R&D (research and development) community, and to the global community. A focus on interdisciplinary R&D programs provides leverage for expertise and talents resident in other MU departments and outside institutions. High priority is given to interdisciplinary programs in engineering and the life sciences, with highest priority on those programs with potential for breakthroughs in healthcare. The focus of MURR service to the global community is harmonious with, and complementary to, research activities by operating within the same technical areas; for example, the development and production of new radiopharmaceuticals can provide training and research opportunities for future workers in healthcare.

The Center's organization includes infrastructure (reactor operations, health physics, machine and electronics shops, engineering design and computer services), income generation (technical applications) and R&D. The scientific research spans a broad spectrum of disciplines (including anthropology, archaeometry, art history, chemistry, epidemiology and immunology, geology, health physics, human and animal nutrition, nuclear engineering, physics and radioisotope studies) and techniques (activation analysis, elastic and inelastic neutron scattering, gamma-ray scattering and neutron radiography).

In 1998 the Center employed 100 persons, plus about 25 students, one-third of whom were pursuing PhD and MS thesis research degrees. Additionally, 15 MU faculty who are based in academic departments also hold research investigator positions at the Center. Externally sponsored research expenses administered by the Center in 1998 totaled more that $1.6 million.

For more information about the reactor center, please visit our web site at: www.missouri.edu/~murrwww.

THE JOHN M. DALTON CARDIOVASCULAR RESEARCH CENTER is a multidisciplinary facility devoted to cardiovascular research and to graduate and postgraduate training. Housed in a modern building in Research Park, south of campus, the center has excellent facilities for research in all biomedical disciplines including molecular biology, biochemistry, physiology, pharmacology and bioengineering. The center also is closely tied to clinical disciplines in the School of Medicine and College of Veterinary Medicine. Programs are directed toward understanding heart failure, renal failure, hypertension, diabetes and the effects of exercise on cardiovascular function. Basic molecular and biochemical research includes mechanisms of cellular toxicity of oxygen and superoxides, studies of cyclic nucleotides, cellular calcium transport and the effects of nitric oxide on vascular function. The center contributes to the University by serving as a nucleus for collaborative studies drawing upon the expertise and talents of faculty from medicine, veterinary medicine, arts and science, and engineering. Support for much of the center's activities comes

from grants and contracts from federal, state and industrial agencies.

THE INDUSTRIAL AND TECHNOLOGICAL DEVELOPMENT CENTER (ITDC), a research facility unit, is designed to enhance American industrial productivity and, in the process, enhance America's competitive position in the world market through fundamental engineering research.

Particular attention is given to basic investigations involving emerging technologies with high potential for positive impact on the practice of engineering design and manufacturing. The center understands that the relevance of research activities to society requires the development of strong ties with industry and the government agencies most concerned with the impact of these technologies.

The center's mission is accomplished through its people and programs. The research has a strong interdisciplinary nature, as demonstrated by the involvement of students and faculty from the colleges of engineering, arts and science, and business and public administration. The ITDC is organized to avoid the usual delay in application of significant and useful research results. To accomplish this it employs a number of unique programs: Research and Development Program, Technology Transfer and Software Users Group.

ITDC research is funded by contracts and grants involving both individual faculty and groups of investigators. The topics cover a wide range of subjects related to the center's research interests. Sponsorship comes from federal, state and private sources.

The ITDC has recently succeeded in stimulating research relating to the product delivery process for increased productivity, quality in design and manufacturing, and protecting the environment from hazardous industrial waste.

THE PARTICULATE SYSTEMS RESEARCH CENTER: Understanding how small, dust-like particles evolve and move is critical to combustion, acid rain, atmospheric sciences, nuclear reactor safety, materials manufacturing and environmental quality. The Particulate Systems Research Center provides a focus for researchers from chemical, civil, mechanical and nuclear engineering; chemistry; mathematics; and physics to study this area. Ongoing funded research includes topics of single-particle and integral experiments; indoor air pollution; clean-room technology; radon measurements and mitigation; nucleation and condensation; particle lotion in viscous fluids; and materials manufacturing using aerosol reactors and large-scale computer code development.

THE SCIENCE INSTRUMENT SHOP (MACHINE SHOP) AND THE GLASSBLOWING SERVICE have facilities and personnel to help design and build sophisticated research equipment or to modify research equipment to meet the specific needs of the investigator. The shop also repairs equipment whether it's simple, complex, or obsolete. Examples of equipment fabricated by the shop include a cryosurgery brain probe, microcalorimeter and tantalum cells, gas exchange chambers, stainless steel swine metabolism cages, a wafer-thin bone saw, a soil-moisture detector, a time-in-flight neutron spectrometer, a heart pump, a sequential learning apparatus, a liquid metering unit, a shock tube, a spore sampler and an automatic calorimeter. Shop personnel can work with almost any type of material. For additional information, or to tour the shop, call John Kemp, supervisor, at (573) 882-3711.

ELECTRONIC INSTRUMENT LABORATORY: This versatile facility, housed in the Physics Building, has a capability of designing, building and maintaining complex electronic computer-based research systems, analytical instrumentation, and other laboratory equipment. The staff also advises research personnel concerning research project approaches, feasibility, and component selection/procurement. The competent and talented personnel in this facility create a unique capability for the MU campus. For more information, Call "EIL," at (573) 882-4024 or view their website at: www.missouri.edu/iats/eil.

Accountancy

School of Accountancy
College of Business and Public Administration
312 Middlebush Hall (573) 882-4463

FACULTY

Earl R. Wilson, director, professor, CPA, PhD, University of Missouri-Columbia. The effects of municipal financial reporting practices on bond borrowing costs; impact of corporate financial reporting practices on security prices; value of the audit function.

Raymond C. Dockweiler, director of the 150-hour accountancy program, associate professor, CPA, PhD, University of Illinois. Financial accounting theory and practice, auditing, and accounting education.

Jere R. Francis, director of doctoral studies, professor, CPA, PhD, University of New England (Australia). The economics of auditing, ethics, and the meaning of expertise in professional accounting practices.

Loren A. Nikolai, professor, CPA, PhD, University of Minnesota. Accounting policy-making and behavioral aspects of accounting.

James E. Parker, professor, CPA, PhD, Michigan State University. Tax aspects of business decision making, professional judgments of tax practitioners, and tax education.

James C. Stallman, professor, PhD, University of Illinois. Value and use of accounting information in quantitative decision models and performance evaluation.

Vairam Arunachalam, associate professor, PhD, University of Illinois. Behavioral research in accounting, negotiation and group decisions in management accounting settings, and information systems.

Inder Khurana, associate professor, PhD, Arizona State University. Financial accounting and auditing, market effects of financial statement disclosures, regulatory asset valuation in public utilities, the information content of audit qualifications and auditor changes.

Jenice Prather-Kinsey, associate professor, CPA, PhD, University of Alabama. International capital markets issues, geographic segment disclosures of multinational corporations, pedagogic international accounting methods and international accounting history.

T.J. Atwood, assistant professor, PhD, University of Illinois. Empirical investigation into the interaction between taxation and financial reporting, manager compensation and organizational form.

Elaine G. Mauldin, assistant professor, PhD, University of Nebraska at Lincoln. Impact of technology on organizational control mechanisms, employee stock ownership plans, and the theoretical structure of information systems.

Scott L. Summers, assistant professor, PhD, Texas A&M University. Investigation of fraud and related party transactions; investigation of predecisional information using computer intensive techniques; regulatory influences on accounting choice.

Billie Cunningham, adjunct assistant professor, PhD, North Texas State University. Accounting education and accounting regulation.

DEGREES: M Acc and PhD in accountancy

The School of Accountancy offers graduate work leading to the master of accountancy and doctor of philosophy degrees. Graduate programs in accountancy prepare students for advanced professional careers in public, private and governmental accounting, and for careers in teaching and research.

Alert to change and recognizing that accounting education at the graduate level should be ahead of current practice, the school's programs require course work stressing advanced knowledge in accounting theory and practice, quantitative methods, economics and business. Opportunities exist on and off campus for exchanging ideas with practicing accountants and for participating in the solution of their professional problems.

Among the school's special facilities are a comprehensive collection of accounting and investment services, computer data bases, technical journals, and microfilm copies of annual reports, government documents and doctoral dissertations.

Fellowships, scholarships, and teaching and research assistantships are available to qualified graduate students. Applications should be submitted by February 15.

For application forms and additional information regarding the master of accountancy degree, write to Dr. Raymond Dockweiler, director of the 150-hour program in accountancy, School of Accountancy, 312 Middlebush Hall, University of Missouri-Columbia, Columbia, MO 65211.

For information about the doctoral degree in accountancy, write to Dr. Jere Francis, director of the doctoral program in accountancy, School of Accountancy, 312 Middlebush Hall, University of Missouri-Columbia, Columbia, MO 65211.

MASTER'S DEGREE: The master of accountancy (M Acc) program encompasses the last 30 hours of MU's 150-hour accountancy program and presumes students have completed the undergraduate portion of the program, or the equivalent. Students whose undergraduate education is not equivalent to the first 120 hours of the 150-hour program may overcome important deficiencies by taking additional courses approved by the program director.

To be considered for acceptance in the M Acc program candidates must have:

- completed the first 120 hours of MU's 150-hour program or received a baccalaureate degree from an accredited college or university with a major in accountancy or the equivalent (students with bachelor's degrees in non-accounting areas may enter the M Acc program after completing an appropriate set of "prerequisite" courses).
- compiled a GPA of at least 3.0 (A=4.0) for the last 60 hours of undergraduate education.
- obtained a 75th percentile (or higher) score on the Graduate Management Admissions Test (GMAT).

In addition to the requirements listed above, other factors such as work experience and maturity also may be considered to the extent that they provide indications of a student's ability to be successful in the M Acc program. Also, in some situations a higher GMAT score may offset a lower GPA, and vice versa. International students whose native language is not English must present a minimum score of 600 on the Test of English as a Foreign Language (TOEFL).

Enrollment in the M Acc program each year is limited to 100 students, including MU undergraduate accountancy majors who transfer to the graduate (fifth) year of the 150-hour accountancy program. In the event the enrollment limit is reached, the highest qualified applicants will receive preference in admission decisions. The growing scope and diversity of functions being performed by professional accountants has created a strong demand for individuals who have both a broader base of general and business education as well as more in-depth technical accounting education than can be obtained in a four-year baccalaureate program. MU's M Acc program is designed especially to provide the additional breadth and depth of knowledge and skills required for success in contemporary accounting practice.

The basic 30-hour M Acc curriculum requires a minimum of 15 hours of accountancy courses and a minimum of 15 hours of courses reserved exclusively for graduate students. A maximum of six semester hours of graduate-level course work may be transferred from another accredited master's program.

Through numerous electives, the M Acc program provides great flexibility to enable customized programs of study in specialty areas of particular interest to students. Two of the most popular areas of specialization are taxation (where a "tax track" is available in cooperation with MU's School of Law) and information systems. Other specialties may be developed in the areas of financial accounting and auditing, and managerial accounting.

DOCTORAL DEGREE: Criteria for admission to the school's doctoral program are:

- a prior record of outstanding academic performance;
- a minimum GMAT score of 600; and
- strong letters of recommendation.

Prerequisites to undertaking doctoral course work include one, and preferably two semesters of calculus; an introductory statistics course; intermediate-level microeconomic theory; and an undergraduate accounting major (or equivalent). Prior graduate work is not required for admission to the program, and master's-level accounting course work does not normally lessen the degree requirements described below.

The University requires 72 total hours beyond a baccalaureate degree for a PhD. In order to meet this requirement, the School of Accountancy requires the following program of course work and dissertation research:

- 15 hours in doctoral-level accounting research courses;
- 15 hours of course work in supporting theoretical fields (e.g., economics, finance, organizational theory and behavior);
- 18 hours of statistics and other research methods courses;
- 8 hours in a weekly research seminar (meeting one hour per semester for four years);
- 12-16 hours of dissertation research.

Course work is designed to be completed in five semesters (two and one-half years). Com-

prehensive examinations are then taken in the second semester of year three, and year four is devoted to the completion of a research dissertation.

Specializations are available in all areas of faculty research interests, though the program particularly emphasizes financial accounting, auditing and behavioral accounting research.

COURSES

200—Independent Readings (1-3). Independent readings and examination under the supervision of an accountancy professor. Prerequisites: instructor's consent and departmental consent.

258—Computer-Based Data Systems (3). Introduces computer and computer-based systems. Includes historical background, systems design, programming concepts, and business applications. Prerequisite: Accountancy 36.

301—Problems in Accounting (1-3). Independent investigations, reports on approved topics. Prerequisites: instructor's consent and departmental consent.

305—Financial Accounting Concepts (3). Current issues in the financial reporting of business corporations to external parties. Not open to accountancy majors. Prerequisite: 37.

310—Managerial Accounting (3). Financial and cost accounting concepts. Processes for collecting, recording, and summarizing financial and cost data. Use of accounting data for position reporting, income determination, planning and control. Prerequisites: MBA or MSPA candidate, or departmental consent.

326—Financial Accounting Theory and Practice I (3). Institutional structure, conceptual framework, and reporting standards and practices of financial accounting, with special emphasis on accounting for assets. Prerequisite: 37 or 137GH.

328—Accounting Information Systems (3). Introduction to accounting information systems, including transaction and file processing, database management, control concepts and security systems design, evaluation, and implementation. Prerequisite: 258.

346—Financial Accounting Theory and Practice II (3). Continuation of 326, with special emphasis on accounting for liabilities and ownership equity. Prerequisite: 326.

347—Cost and Managerial Accounting (3). Activity based and traditional job order and process cost systems for service, merchandising, and manufacturing companies; standard costs and variances. Prerequisites: 37 or 137GH and 258.

353—Introduction to Taxation (3). Introduction to taxation, emphasizing the U.S. federal income tax on individuals, including underlying concepts and tax planning issues. Prerequisite: 37 or 137GH.

358—EDP Systems Analysis and Design (3). Modern information systems analysis and design, focusing on transaction processing. Prerequisite: 258.

365—Governmental Accounting and Budgeting (3). Introduction to government and not-for-profit accounting. Principles of fund accounting, budgeting, auditing, and financial reporting in government and not-for-profit entities. Prerequisite: 326.

373—Taxation of Business Entities (3). Federal income taxation of corporations and shareholders, partnerships, and S corporations. Prerequisite: 353.

384—Auditing Theory and Practice I (3). Introduction to the auditing profession, attest function, and generally accepted standards for conducting audits. Prerequisites: 328 and 346.

390—Professional Accounting Internship (3). Provides full-time professional accounting work experience of at least eight weeks duration. Completion of first 105 hours of 150-hour accountancy curriculum (or equivalent) and consent of Internship Coordinator. Graded on S/U basis only.

401—Problems in Accounting (1-3). Independent investigations, reports on approved topics. Prerequisite: instructor's consent.

408—Accounting Information Systems Theories and Concepts (3). Theories and concepts in accounting information systems with emphasis on expanding analytical and communicative skills. Prerequisite: 328.

414—Information Systems Assurance and Control (3). A combination of control theory, concept application, demonstration of actual practice and student research to develop an understanding of the concepts and practices used in the design, development or assurance of information systems (IS) controls. Prerequisites: 328 and 384.

423—Tax Research and Judgment (3). Applied tax research using print and electronic data bases; heuristic biases in tax judgments; responsibilities of professional tax practices. Prerequisite: 373.

425—Accounting for Governments and Other NonProfit Entities (3). Role of accounting information systems in planning, managing, and controlling nonbusiness organizations; reporting to external parties; concepts of governmental auditing. Prerequisites: 365 or instructor's consent.

428—Data Warehousing and Data Mining (3). Applications development in information systems with software engineering. Prerequisite: CECS 103 and departmental consent.

434—Applications of Auditing Concepts (3). Application of auditing concepts and techniques in various phases of audit engagements. Prerequisite: 414

436—Financial Accounting Theory and Practice III (3). Continuation of 346. Addresses a series of special financial accounting topics including income taxes, pensions, leases, business combinations, consolidated statements, and foreign currency translation. Prerequisite: 346.

437—Strategic Cost Analysis (3). Analysis to support organizational strategy including cost management, performance evaluation, and control of responsibility centers. Prerequisites: 347, Math 61 and Statistics 250, or the equivalent.

444—Seminar in Auditing (3). Auditing in society; auditor's responsibilities; methodology, techniques, and procedures; planning and administration of an audit; collection and evaluation of evidence; reporting; and new audit directions and perspectives. Prerequisites: doctoral candidacy or instructor's consent.

446—Application of Financial Accounting Pronouncements (3). Development, content and application of authoritative pronouncements in financial accounting. Problems and case studies. Prerequisite: 436.

448—Issues in Accounting Systems Development (3). Selected current topics in the development and use of accounting information systems. Prerequisite: 408.

450—Contemporary Issues and Accounting/Professionalism (3). Study of issues affecting the accountancy profession and the professional accountant. Prerequisite: 27 hours of accountancy courses.

453—Tax Issues and Analysis (3). Introduction to tax policy issues and analysis with emphasis on major areas of current tax debate. Prerequisite: 373

455—Seminar in Governmental Auditing (3). Topics related to external and internal auditing of governmental organizations and programs. Prerequisites: 384 and 365, or instructor's consent.

457—Quantitative Methods in Accounting (3). Application of mathematics and statistics to managerial and financial accounting problems. Prerequisites: 337, Mathematics 60 and 61 and Statistics 250.

466—Financial Accounting Theory II (3). Role of theory in defining fundamental accounting and reporting concepts; contemporary theoretical developments; role of theory in accounting research. Prerequisite: doctoral candidacy or instructor's consent.

467—Seminar in Managerial Accounting (3). Critical review of the managerial accounting research literature with emphasis on issues and research methods. Prerequisite: doctoral candidacy or instructor's consent.

489—Cultural Significance of Accounts (3). Orientation course presenting the cultural situation which gives importance to modern accounting. Critical appraisal of trends in theory and functions of current accounting. Prerequisites: doctoral candidacy or instructor's consent.

491—Research in Accounting (1-99). Each student is under direction and guidance of an accountancy professor in writing a dissertation. Periodic seminars discuss research projects. Graded on a S/U basis only.

Agricultural and Extension Education

College of Agriculture, Food and Natural Resources
121 Gentry Hall (573) 882-7451
Fax (573) 884-4444
http://www.ssu.missouri.edu/SSU/AGED/

FACULTY

Robert J. Birkenholz, professor, PhD, Iowa State University

Bob R. Stewart, professor, EdD, University of Maryland-College Park

James E. Dyer, assistant professor, PhD, University of Illinois

Bryan L. Garton, assistant professor, PhD, The Ohio State University

The program is designed for students with interests in the fields of agricultural and extension education or informal adult education. Course work includes program and professional development, evaluation, teaching and learning theories and practices, educational methods, organization and administration. The program may serve as a support area for students seeking a graduate degree in the colleges of Education, Human Environmental Sciences, and Agriculture, Food and Natural Resources.

COURSES

250—Professional Leadership Development (3). Review of the principles and practices associated with effective professional leadership. Students will examine and practice interpersonal skills that contribute to leadership success. Prerequisite: English 20 and sophomore standing. f, w.

280—Teaching Farm and Personal Financial Management (2). Principles of farm and personal financial management. Topics include record keeping, depreciation, tax management, credit management, and budgeting. Emphasis on teaching financial management concepts. f.

300—Problems (1-99). Supervised and independent study of problems and issues in Agricultural Education at the undergraduate level. Prerequisite: instructor's consent. f,w,s.

301—Topics in Agricultural Education (1-3). Courses on specialized topics offered on a trial basis until the course has been assigned a course number. f,w,s.

350—Communicating in Agriculture (3). Application of written and oral communcation skills to agricultural content, application of human relations skills, and acquisition of an integrated picture of the communications process as it relates to the agricultural industry. Prerequisite: junior standing. f,w.

360—Rationale and Structure of Agricultural Education Programs (3). This course provides future agricultural educators with a comprehensive overview of a complete Agricul-

tural Education program involving classroom instruction, supervised experience, and personal development. Prerequisite: junior standing. f.

361—Integrated Field Experience I (1). A field-based experience that provides students with comprehensive experience directed toward the planning, supervision, and evaluation of Supervised Agricultural Experience Programs in secondary agriculture programs. Prerequisite: concurrent enrollment in Agr Ed 360. Graded on S/U basis only.

370—Designing Curriculum and Instruction in Agriculture (3). Instructional methodology course focused on analyzing the principles of learning and teaching and designing curriculum and instruction for teaching agriculture subjects in formal and informal educational settings. Prerequisites: Agricultural Education 360 or junior standing. w.

371—Integrated Field Experience II (1). A field-based experience that examines the integration of Supervised Agricultural Experience and Career Development Events into the secondary agriculture curriculum. Investigates the use of advisory committees and graduate follow-up data in curriculum planning. Prerequisite: concurrent enrollment in Agr Ed 370. Graded on S/U basis only.

380—Teaching Agriculture Subjects (3). Instructional methodology course focused on teaching approaches and methods, problem-solving teaching techniques, and managing learning environments for teaching agriculture subjects in formal and informal settings. Prerequisite: Agricultural Education 370. f.

390—Internship in Agricultural Education (1-4). Field-based learning experience that combines study, observation, and employment with an agricultural business, industry or government agency in the area of education, training, and development. Individual internship plans are developed by a student, faculty supervisor, and an industry cooperator. Prerequisite: Internship Coordinator's consent. f,w,s.

395—Internship Seminar (3). Seminar focused on the problems of practice and developing skills needed for a career in teaching agriculture at the secondary level. The core of the seminar is on coordinating experimental learning and leadership development activities, managing the complete program, and professional development. Prerequisite: concurrent enrollment in Agr Ed 399.

399—Student Teaching Internship in Agriculture (1-12). A field-based learning experience that combines observation and practice in a secondary/adult agriculture program. The purpose of the internship is to provide an opportunity to apply teaching and learning concepts in a practical context. Prerequisite: Internship Coordinator's consent. w.

400—Problems (1-99). Prerequisite: instructor's consent. f,w,s.

406—Career and Technical Education for Adults (3). Principles and practices of teaching adult learners in both formal and informal settings. Course units including needs assessment, planning, conducting, and evaluating adult education programs. Prerequisite: instructor's consent.

410—Seminar (1-99). Prerequisite: departmental consent.

415—College Teaching of Agriculture (2). A course designed to assist current or future college faculty who wish to improve their teaching skills. Topics include theories, principles and practices associated with effective teaching and learning in higher education.

420—Induction Year Teaching I (1-2). Continuing education course for the professional development of first-year teachers of agriculture. The course focuses on the pedagogical knowledge, skills, and attitudes and managerial skills needed by beginning teachers of agriculture. Prerequisite: instructor's consent. f.

421—Induction Year Teaching II (1-2). Continuing education course for the professional development of second-year teachers of agriculture. The course is a continuation of Ag Ed 420 and focuses on the pedagogical knowledge, skills, and attitudes and managerial skills needed by beginning teachers of agriculture. Prerequisite: Agr Ed 420. f.

425—Inservice Course in Agricultural Education (1-99). Professional development course which focuses on enhancing the technical, administrative, or management skills of agricultural educators.

426—Farm Business Management Analysis I (2). Provides the basic background and knowledge for an instructor to develop and implement the Farm Business Management Analysis program in the local community.

427—Farm Business Management Analysis II (2). Provides the basic background and knowledge for an instructor to work with farm business managers in analyzation and charting their business operations.

430—Grant Proposal Writing (3). Preparation of proposals designed to solicit grant funding to support teaching, research or outreach programs. Emphasis on proposal development, identifying funding sources, and proposal review processes.

440—Student and Teacher Development in Agricultural Education (3). Examines planning and supervising career exploration, experiential learning, and leadership development activities of secondary agriculture students. The professional development of the secondary agriculture teacher is also examined. Prerequisite: Agr Ed 360 or equivalent.

445—Distance Learning with Adults in Agriculture (3). A course examining the princpals of learning as they relate to delivering education at a distance. Prerequisite: Agr Ed 380 or instructor's consent.

450—Research (1-99). Independent research activities that culminate in a written research report but not a thesis. Prerequisite: instructor's consent.

455—Preparing Manuscripts for Publication (1). An introduction to planning, preparing, and submitting research based articles for publication in professional journals and research proceedings.

460—Program Leadership and Administration (3). Principles of admininstration and organization and their applications to extension work. Prerequisite: instructor's consent.

470—Program Development and Evaluation (3). (same as Rural Sociology 403). Program development principles, teaching plans and evaluation principles applied to extension program development. Prerequisite: instructor's consent.

480—Improving Instruction in Career and Technical Education (3). Explores the principles and psychological aspects of teaching and learning; teaching strategies, methods, and techniques; curriculum organization; evaluating student learning; motivating students; managing the learning environment; use of technology; and personal teacher bahaviors that influence learning. Prerequisite: Agr Ed 380 or instructor's permission.

490—Research (1-99). Prerequisite: instructor's consent. Graded on a S/U basis only.

Agricultural Economics

College of Agriculture, Food and Natural Resources
200 Mumford Hall (573) 882-3747
http://www.ssu.missouri.edu/ssu/AgEc/gradguid.htm

Agricultural economics, along with community development, agricultural and extension education, and rural sociology, comprises the Social Sciences Unit of the College of Agriculture, Food and Natural Resources, with Michael Nolan serving as unit leader.

FACULTY

Kevin C. Moore, director of graduate studies, associate professor, PhD, Iowa State University. Farm management, production, and finance.

Melvin G. Blase, professor, PhD, Iowa State University. Economic development and institution building.

Maury E. Bredahl, professor, PhD, University of Minnesota. Trade policy and international marketing.

J. Bruce Bullock, professor, PhD, University of California-Berkeley. Marketing and policy.

Michael L. Cook, professor, PhD, University of Wisconsin. Agribusiness managements, cooperatives, marketing, and structure of markets.

Brady J. Deaton, PhD, University of Wisconsin. Economic development.

John E. Ikerd, extension professor, PhD, University of Missouri-Columbia. Farming system analysis.

Thomas G. Johnson, professor, PhD, Oregon State University. Regional economics.

Stephen F. Matthews, professor, PhD, JD, University of Missouri-Columbia. Environmental, agricultural, agribusiness, and biotechnology law.

Ronald L. Plain, professor, PhD, Oklahoma State University. Livestock marketing.

Tony Prato, professor, PhD, University of California-Berkeley. Resource and environmental economics.

Kenneth C. Schneeberger, professor, PhD, Oklahoma State University. Farm management.

Abner W. Womack, professor, PhD, University of Minnesota. Policy analysis and information systems.

Bruce Bjornson, associate professor, PhD, University of California-Davis. Investment finance and managerial economics.

Nicholas Kalaitzandonakes, associate professor, PhD, University of Florida. Economics of technology and production economics.

Michael S. Kaylen, associate professor, PhD, Purdue University. Economic development and natural resources.

Francis P. McCamley, associate professor, PhD, Iowa State University. Production economics and risk analysis.

Michael J. Monson, associate professor, PhD, University of Florida. Farm management, production, and resource economics.

Richard K. Rudel, associate professor, PhD, Colorado State University. Grain marketing.

Donald L. Van Dyne, research associate professor, PhD, University of Maryland. Natural resources and alternative agriculture analysis.

Robert Young, research associate professor, PhD, University of Missouri. Policy analysis.

Gary Adams, research assistant professor, PhD, University of Missouri. Policy analysis.

D. Scott Brown, research assistant professor, PhD, University of Missouri. Policy analysis.

Jan Dauve, assistant professor, PhD, Colorado State University. Economic education and natural resource economics.

Elizabeth Dunn, research assistant professor, PhD, University of Wisconsin-Madison. Environmental and development economics.

Chris Fulcher, research assistant professor, PhD, University of Missouri-Columbia. Resource and environmental economics.

Raymond Massey, extension assistant professor, PhD, Oklahoma State University. Crop economics.

Joseph Parcell, assistant professor, PhD, Kansas State University. Farm management.

Vern L. Pierce, extension assistant professor, PhD, University of Missouri-Columbia. Beef economics.

Zeyuan Qiu, research assistant professor, PhD,

University of Missouri-Columbia. Resource and environmental economics.

Michael Sykuta, assistant professor, PhD, Washington University. Agribusiness management.

Corinne Valdivia, assistant professor, PhD, University of Missouri-Columbia. Economic development and agricultural research policy.

Patrick Westholf, research assistant professor, PhD, Iowa State University. Policy analysis.

DEGREES: MS and PhD in agricultural economics

The doctoral degree program emphasizes preparation for research, teaching and extension. The MS program may be a step toward the PhD, but is frequently used as a terminal program for those interested in agribusiness, extension or government. Programs are flexible. All PhD and most MS students become involved in research, but those whose career interests lie in other directions find the department willing to accommodate them.

A 3.25 GPA (A=4.0) is generally a minimum requirement for financial assistance such as fellowships and assistantships for research and teaching. Reasons for supporting a student with a GPA below 3.25 must be documented in detail. ***For further information on financial assistance write to Kevin Moore, director of graduate studies in agricultural economics, 200 Mumford Hall, Columbia, MO 65211.***

MASTER'S DEGREE: Before admission to the MS program, a student should have completed at least nine hours of agricultural economics or economics, a course in calculus and one in statistics.

For the MS degree, a minimum of 30 hours selected from courses accepted for graduate credit must be completed. The program must include at least two graduate-level courses in micro- and macroeconomic theory and one graduate-level statistics course in multiple regression. Credit for research (usually six to eight hours) is included in the minimum 30 hours for those opting for MS with thesis. An alternative MS nonthesis program requires that some additional course work be substituted for thesis research.

DOCTORAL DEGREE: Prerequisites for the PhD program include courses in:

Intermediate Price Theory
Intermediate Income Analysis
Introductory Quantitative Economics
Introductory Mathematical Statistics
Regression and Correlation Analysis

Departmental acceptance of the student as a PhD candidate is based upon satisfactory performance on a qualifying examination. This exam is taken after completion of two semesters of course work in economic theory, quantitative methods and research methodology.

The size, quality and diversity of the faculty provide a broad choice of advisers and research topics. Students may specialize in agribusiness management, resources and development, or markets, trade and policy. The student and the doctoral advisory committee have considerable latitude in planning a program of study. There is no foreign language requirement.

The general course requirements of the department consist of a well-balanced selection of courses, including agricultural economics courses at the 400 level in the student's interest area, graduate courses in economic theory, and quantitative methods and econometrics. The program usually includes about 15-18 courses (excluding research) beyond the bachelor's degree. The course of study, which emphasizes particular interest areas, should prepare the student for comprehensive exams.

A dissertation embodying the results of original research must be written on a subject approved by the program committee. An oral examination over the dissertation completes the degree requirements.

COURSES

200—Problems (1-99.9). Supervised study in specialized phase of agricultural economics. Prerequisite: introductory course in Agricultural Economics. f,w,s.

223—Agricultural Sales (3). Principles of salesmanship in agricultural input and output markets; buyer motivations; time and territory management; communication models and techniques; planning and executing sales calls; after-sale service. Prerequisites: Agricultural Economics 41 and junior standing. f,w.

224—New Products Marketing (3). Learning experience to develop skills in marketing new ag products. To include: market analysis, goals and objectives, action plan, financial and monitoring and measurement. In small groups, students will develop complete marketing plan for a new product. Prerequisites: 41 and English 20. f,w.

225—Statistical Analysis (3). Elementary statistical inference. Prerequisite: Mathematics 10 or equivalent.

230—Agricultural and Rural Economic Policy (3). Study and analysis of past and present government policies affecting agriculture and rural economy. Prerequisite: Agricultural Economics 40 and 41. f.

241—Cooperative Business Organizations (3). Cooperative business organizations; importance; principles; economic problems. Organizational procedures. Operational practices. Prerequisite: Agricultural Economics 183.

250—Economics of Agricultural Production and Distribution (3). Examines current national and international issues affecting agriculture. Applies economic principles to agricultural problems. Prerequisites: 50 or Economics 51 & Mathematics 10 or equivalent.

251—Agricultural Prices (3). Variations in prices of agricultural products; underlying factors. Prerequisites: Agricultural Economics 123, 183 and Statistics 150. w.

256—Agribusiness and Biotechnology Law (3). Legal concepts applicable to agribusiness and biotech firms. To include contracts, torts, product liability, warrenties, corporate farming laws, UCC, corporations/partnerships/limited liability companies, labor laws, patent copyrights/trademark laws, international and ethical perspectives. Prerequisites: 3 hours of Ag Economics or Economics.

257—Rural and Agricultural Law (3). Everyday practical legal problems facing rural residents, farmers, agribusiness, and local government. Laws include statutes, common law (cases), customs, and administrative regulations. Topics include corporate/contract farming, right-to-farm, leases, fence laws, estate planning and water rights. Prerequisites: 3 hours of Ag Economics or Economics.

260—General Farm Management (3). Economics and management principles applied to planning and operating farm businesses. Includes enterprise combination, resource acquisition, water management, profit maximizing techniques and annual adjustments to changing conditions. Prerequisite: Agricultural Economics 41. f,w.

270—Environmental and Natural Resource Economics (3). Economic principles applied to environmental issues and problems in natural resource menagement. Evaluation of alternative public approaches in rural agricultural, and international settings. Prerequisites: 40 and 41 or Economics 4 and 5.

271—International Agricultural Development (3). Examines world food problem; analyzes its causes; economic and noneconomic policy alternatives for modernizing agriculture in less-developed countries. Prerequisites: Agricultural Economics 40 and 41 and junior standing. w.

272—International Food Trade and Policy (3). Examines food trade; develops economic analyses of trade impacts of domestic agricultural policies; examines international trade agreements; and interface of trade and environment. Prerequisites: Agricultural Economcis 40 and 41 or Economics 4 and 5. No plus minus grading. w.

280—Financing the Farm Business (3). Financial management of farm business. Operational methods of credit institutions serving agriculture. Prerequisites: 41 and Accountancy 37.

282—Agribusiness Finance (3). Application of the concepts and methods of finance to the management of agribusiness firms, including cooperatives. Special attention is given to the working capitalneeds of agribusiness and to the specialized lending institutions in the agricultural economy. Prerequisite: Ag Econ 41 and Accountancy 37. w.

294—Commodity Marketing (3). Theory and applied decision making in marketing grain and livestock with emphasis on both cash and futures markets. Prerequisite: Agricultural Economics 183. w.

301—Topics in Agricultural Economics (1-6). Current and new topics not currently offered in applied and/or theoretical areas in Agricultural Economics.

310—In-Service Course in Agricultural Economics (2-10). A. Profit Maximizing Principles B. Farm Planning C. Farm Records and Analysis D. Business Management E. Using Computers in Farm Management Decision Making Basic principles of farm management. Applications of principles and subject matter in successful classroom presentation primarily for high school teachers. Course is offered in sections A-E as listed, for 2 hours each. Prerequisites: 10 hours credit in Agricultural Economics, including 260, or instructor's consent.

312—Planning the Farm Business (3). Economic analysis and planning of the farm business and its organization. Applications of computerized management techniques to farm business including resource acquisition, tax management, enterprise analysis, and business analysis through farm records and budgets. Prerequisites: Agricultural Economics 260 or Agriculture 111 or equivalent. w.

314—Farm Business Analysis (3). Techniques of analyzing a farm business. Methods of resource acquisition, record analysis, tax management principles, and organizational structure of the farm business are principal topics covered. Prerequisites: 260.

319—Agri-Food Business and Cooperative Management (3). Risk management in the global agrifood chain, including managing the unique uncertainties of biological production processes, global market analysis, and government intervention, of risk mananagement tools and institutions unique to strategic decisionmaking in agribusiness and cooperative firms. Prerequisites: Agricultural Economics 183 and 256, Management 202. w.

320—Agri-Food Business Management Strategy (3). Analysis of industry forces in Agriculture and food sector. Assessing risks and firms capabilities. Development of firm's competitive strategy, including vertical integration, diversification, international business option, and financial planning and performance measurement. Prerequisites: Agricultural Economics 183 and 282 and Agriculture 111. f.

321—Economic History of Agriculture (3). Emphasizes Europe and U.S. historical interpretation; usefulness in evaluating present and probable future developments in agricul-

ture.

338—Rural Real Estate Appraisal (3). (same as Agricultural Engineering 338). Principles, techniques, practices of rural real estate appraisal. Field trips. Prerequisites: 260 and Agronomy 100.

355—Economics of Agricultural Production and Distribution (3). Applies economic principles to agricultural production including price theory, linear programming and uncertainty. Prerequisites: Economics 251, Mathematics 207, Statistics 207 or equivalent.

356—Environmental Law and Policy (3). Legislative, administrative, and common law dealing with the environment. Introduces the fundamental concepts and classic issues underlying the body of law and policy dealing with the environment. Includes air and water quality, endangered species preservation, land use, and waste disposal. Prerequisites: Ag Econ 256 or 257, or graduate standing, or instructor's consent.

360—Senior Seminar (3). Applications of economic concepts to formulate positions on issues. Includes discussion sessions, student team presentations and guest lecturers. Prerequisite: senior standing. w.

390—Internship Experiences in Agricultural Economics (1-99.9). Combines study, observation, and employment in a public agency or private firm in marketing, farm management, or credit. Staff supervision and evaluation. Reports required. Prerequisites: 75 hours of course work and instructor's consent. f,w,s.

400—Problems (1-99.9). Supervised study, research in specialized phases of agricultural economics. Prerequisite: instructor's consent.

410—Seminar (1). Lectures, reports on economic problems in agriculture. f,w.

420—Theory of Markets (3). Development of theories of monopolistic, monopolistic competition; application to agricultural markets. Market structure influence on price, nonprice competition in buying, selling of farm products and inputs. Prerequisites: 16 hours economics, including Economics 351. w.

422—Organizing and Adjusting the Farm Business (3). Applies principles of economics and management in organizing and adjusting farm business units to keep abreast of changing conditions. Normally offered at selected off-campus locations. Prerequisite: instructor's consent.

424—Advanced Production Economics (3). Production function analyses and advanced theory of the firm as applied to agricultural production problems. Concepts of input demand, production supply, quality, time and technology, dynamic analysis and production under uncertainty. Prerequisites: Mathematics 80, 205 or 207; Ag Economics 355; Economics 405 or 451; and Statistics 385 or Economics 472. w.

430—Advanced Price Analysis (3). Applies economic theory and quantitative methods to analyze agricultural price issues. Examines problem formulation, estimation, and model evaluation applied to demand and supply situations. Prerequisites: Economics 405 or 472; Statistics 385. f.

435—Advanced Farm Management (3). Recent changes in agriculture and their impacts on farm management. Techniques in farm management research, teaching and extension; new theories; selected current literature analyzed. Prerequisites: 312 or 314. alt. f, even years.

450—Research (1-99.9). Independent investigation of advanced nature. Report required.

451—Economics of Marketing Livestock and Livestock Products (3). Current economic problems in marketing livestock and livestock products. Methods of solving marketing problems. Prerequisites: 220 and 250. w.

454—Welfare and Consumption Economics (3). Introduces welfare economic principles; application to problems of resource allocation. Appraises economic policies, programs; consumers' choice; measurement of consumption; living standards; household decisions and markets relation. Prerequisites: 12 hours Economics.

458—Economics of Marketing (3). Advanced principles of agricultural economics from standpoint of market system. Theory of the time, space, and form dimensions of economic activity. Topics include location theory, price discovery, price determination, and the role of information in operation of markets. Prerequisites: Economics 405 or 451; a course in Econometrics desirable. f.

465—Current Economic Aspects of Agriculture (3). An application of the theory of welfare economics to analysis of agricultural policy alternatives. Historical perspective of U.S. agricultural policy is examined along with an economic analysis of current issues of domestic agricultural programs and trade policies. Prerequisites: Economics 405 or 451. w.

467—Development and Management of Natural Resources (3). Evaluation of economic rationales and alternative programs for public natural resource management. Static and simple temporal natural resource allocation models. Benefit cost analysis. Prerequisites: Economics 351 or 251 and instructor's consent. f.

468—Resource Economics and Development (3). Methods and criteria of choice in public investment decisions, emphasizes natural resource development. Temporal allocation of resources and its relation to economic development. Economic theory is applied in both a static and dynamic framework to analyze natural resource or problems. Prerequisites: Economics 370, 405 or 451; Mathematics 80, 205 or 207. alt. w, even year.

472—International Agricultural Development Policy (3). An analytical review of economic policies directed toward stimulating agricultural development in the world's low income countries. Prerequisites: Economics 351 and 353 or instructor's consent.

474—Mathematical Modeling for Social Scientist (3). Introduction to mathematical programming, emphasizing problem formulation and solution interpretation. Computer applications are stressed. Prerequisite: Statistics 385 or instructor's consent.

475—Econometrics I (3). (same as Economics 475). Emphasis is given special estimation problems which occur in integrating the theory with various types of economic data.

476—Econometrics II (3). (same as Economics 476).

480—Research Methodology (3). A detailed study of the scientific method and the research process covering the seven major steps in the process-problem definition, hypotheses specification, research design, measurement, data collection, data analysis, and generalization. f.

485—Advanced Topics in Economics (3). Analyzes economic logic problems. Current agricultural economic problems. Prerequisite: graduate standing. w.

490—Research (1-99.9). Independent investigation of advanced nature, leading to dissertation. Graded on a S/U basis only.

Agronomy

College of Agriculture, Food and Natural Resources
205 Curtis Hall (573) 882-7707, Fax [573] 884=7850

Agronomy, along with Horticulture, Entomology, and Plant Pathology comprises the Plant Science Unit of the College of Agriculture, Food and Natural Resources, with Marc Linit serving as unit leader.

FACULTY

Robert E. Sharp, director of graduate studies, professor, PhD, University of Lancaster, England. Plant physiology.

Paul R. Beuselinck, professor, PhD, Oregon State University. Legume breeding.

Dale G. Blevins, professor, PhD, University of Kentucky. Plant physiology.

Edward H. Coe Jr., professor, PhD, University of Illinois. Corn genetics.

Larry L. Darrah, professor, PhD, Iowa State University. Corn breeding.

J. Perry Gustafson, professor, PhD, University of California-Davis. Cereal genetics.

Curtis J. Nelson, professor, PhD, University of Wisconsin. Crop physiology.

David A. Sleper, professor, PhD, University of Wisconsin. Forage and soybean breeding.

Robert J. Kremer, associate professor, PhD, Mississippi State University. Soil microbiology.

Robert L. McGraw, associate professor, PhD, University of Florida. Forage production.

Anne L. McKendry, associate professor, PhD, University of Manitoba. Small grains breeding.

Michael D. McMullen, associate professor, PhD, University of Chicago. Corn genetics.

Harry C. Minor, associate professor, PhD, University of Illinois. Crop ecology.

A.P. Rao-Arelli, research associate professor, PhD, University of Georgia. Plant breeding and genetics.

Craig A. Roberts, associate professor, PhD, University of Illinois. Forage quality.

William J. Wiebold, associate professor, PhD, University of Georgia. Soybean management.

William W. Donald, assistant professor, PhD, University of Wisconsin. Weed science.

Fred Fishel, extension assistant professor, PhD, Mississippi State University. Weed science.

William Johnson, assistant professor, PhD, University of Arkansas. Weed science.

Robert Kallenbach, assistant professor, PhD, Texas Tech University. Forage management.

J. Andrew Kendig, extension assistant professor, PhD, University of Arkansas. Weed science.

Newell Kitchen, assistant professor, PhD, Colorado State University. Soil science.

Hari Krishnan, research associate professor, PhD, Colorado State University. Soybean genomics.

Peter Scharf, assistant professor, PhD, Virginia Tech University. Nutrient management.

Reid Smeda, assistant professor, PhD, Purdue University. Weed science.

DEGREES: MS and PhD in agronomy

The MS and PhD degrees in agronomy may emphasize crop physiology, crop management, weed science, and crop breeding and genetics.

The department maintains field, greenhouse and laboratory facilities for research and teaching. Analytical chemistry, statistical and computing support services are available on campus.

Candidates for graduate study must have a baccalaureate degree from an accredited college and have demonstrated capability to perform graduate-level work. Students are selected from among agronomy majors and others educated in the biological or physical sciences.

Financial assistance, available to qualified students at both the MS and PhD levels, includes fellowships and research assistantships. Research projects funded by the Experiment Station, or by grants, may provide an additional source of support for graduate students.

MASTER'S DEGREE: Students entering the

program should have completed courses in botany, genetics, inorganic and organic chemistry, biochemistry, statistics, physics and advanced mathematics. Inadequacies can be remedied through additional course work immediately after admission. A GPA of at least 3.0 (A=4.0) in the last two years of undergraduate study is required.

The program consists of 30 credit hours beyond the bachelor's degree selected from courses accepted for graduate credit; 15 or more hours must be at the 400 level. Not more than 12 of the minimum 30 hours is permitted for research, problems, special investigations and special readings. At least 12 credits of agronomy courses at the 300 or 400 level are included in the student's graduate or undergraduate program; nine credits are in the student's major area and three are in an alternate area.

Most student programs include a thesis, an original work that demonstrates a capacity for research and independent thought. The nonthesis program, designed for those who need a broad range of agronomic knowledge, requires a written report on a special problem for which three or four credit hours may be earned. The nonthesis program does not serve as preparation for candidacy in a PhD program.

DOCTORAL DEGREE: A student may be accepted for advisement in the PhD program after completion of a bachelor's or master's degree. Candidates must demonstrate promise of becoming a capable investigator in a chosen field. All candidates must complete a qualifying examination.

The curriculum is developed by a doctoral program committee and includes 72 or more hours in graduate courses beyond those taken for the bachelor's degree. There is no departmental foreign language proficiency requirement.

A comprehensive examination, including both written and oral performance, must be passed after successfully completing the program of study with a GPA of 3.0 or better.

The dissertation must be a substantial scholarly report of original research conducted by the student in a specialized area of agronomy.

COURSES: (Plant Science)

201—Topics in Plant Science (1-4). Initial offering of a course(s) in a specific subject matter area. Offered when proposed by a faculty member in that area of expertise.

209—Principles of Weed Science (4). (same as Pest Management 209). Introduction to principles of weed growth, reproduction, and impact on human activities. Discussion of weed control techniques and technology, weed identification, and developing weed management strategies. Prerequisite: 110. f.

211—Ornamental Woody Plants I (3). Identifies and evalautes trees and shrubs for landscape use. Prerequisite: Biological Sciences 1 or 12. f.

212—Ornamental Herbaceous Plants (3). Annuals, biennials, perennials, ground covers, and bulbs; their identification, nomenclature classification, culture and use. Prerequisite: Biological Sciences 1, 10, or 12. f.

213—Genetics of Agricultural Plants and Animals (3). (same as Animal Science 213). Concepts of molecular, transmission, and population and quantitative genetics. Special emphasis given to breeding and biotechnoligical applications in plant and animal agriculture. Prerequisites: Biological Sciences 1, 2 or 10, Mathematics 10. w.

220—World Food and Plant Germplasm (3). The role of plant germplasm in cultivar development, and its preservation for sustainable crop production through International Agricultural Research Centers. Genetic vulnerability of major crops. Prerequisite: Plant Science 110. w.

225—Plant Breeding and Genetics (3). Mendelian genetic principles and related genetic developments applicable in plant breeding. Discussion of established and new plant breeding procedures applicable to cultivar development. Prerequisite: 110 or equivalent.

233—Plant Propagation (3). Principles and practices of propagation of horticultural plants. Prerequisites: Biological Sciences 1 or 12. f.

234—Plant Environments (3). Effects of water, light, temperature, and gases upon growth and physiology of plants; their control in plant production. Prerequisites: Biological Sciences 1 or 12 and Chemistry 15 or 31. w.

250—Landscape Graphics (3). Techniques of perspective and tools for man-inhabited spatial design. f.

254—Landscape Design (3). Historical overview of the human and environmental relationships with respect to design on the land. Prerequisite: sophomore standing. f.

257—Landscape Maintenance (3). Effective management of commercial, public, and home landscape plantings, including topics on landscape renovation, planting, pruning, fertilization, irrigation, and pest management. w.

266—Greenhouse Management (4). Greenhouse design, environmental control and equipment. Practices associated with plant nutrition management, greenhouse pest control, postproduction handling and marketing of greenhouse crops, and greenhouse management are also covered. Prerequisites: 234 and f, even yrs.

273—Forage Crops (3). Principle forage crops, pasture production, forage preservation and utilization. Prerequisite: 110. f.

274—Grain Crops (3). Lecture and discussion covering production and utilization, plus growth and development, of a wide range of grain crops, includeing Missouri crops. Problem solving tasks include agronomics, economics and environmental factors. Prerequisite: 110. f.

290—Undergraduate Research (1-3). Capstone experience consisting of investigations in Plant Science in support of an undergraduate thesis or special project portfolio. Prerequisites: senior standing in Plant Science Degree Program. f,w,s.

300—Problems in Plant Science (1-4). Not accepted as a substitute for any regularly scheduled course. Problems arranged with individual faculty member in specific matter area. Prerequisite: consent required. f,w,s.

301—Topics in Plant Science (1-4). Initial offering of a course(s) in a specific subject matter area. Offered when proposed by a faculty member in that area of expertise.

307—Soil Physics (5). (same as Soils 307).

313—Soil Fertility and Plant Nutrition (3). (same as Soils 313). Discussion of how soil factors determine the supply of essential nutrients to plants; the role of each nutrient, and the management of soil amendments (fertilizers, wastes). Prerequisite: 100, one college level course in plant science, algebra and chemistry. w.

315—Crop Physiology (3). Basic course on crop growth and development. Emphasis is on physiological processes and morphology of crop plants, and their application to crop breeding and management decisions. Prerequisites: 110 and Biochemistry 110 or equivalent.

317—Plant Physiology (3-5). (Same as Biological Sciences 317.) Modern physiology of higher plants using common cultivated plants as examples. May be taken with or without laboratory. Prerequisite: Biological Sciences 10 or 12 and five hours of chemistry.

325—Field Crop Breeding (3). Plant Science 325 will introduce students to the application of genetics and the plant sciences to the breeding and improvement of self-pollinated field crops. Classical, current and innovative plant breeding techniques will be addressed. Prerequisite: 110 and 225. f.

330—Plant Breeding Theory (3). Designed to provide a logical application of genetic concepts to mating and selection theory in general improvement of cross pollinated crops. Prerequisite: 225 or equivalent. w.

350—Special Readings in Plant Science (1-3). Individual study of assigned topics. Prerequisite: instructor's consent. f,w,s.

354—Advanced Landscape Design (4). Development of project presentation techniques by analysis of the social, cultural, historical and ecological aspects of landscape design. Prerequisites: 254, instructor's consent. w.

355—Turf (3). Characteristics of turf materials, principles of establishment and maintenance. Prerequisites: 100 and 234 or instructor's consent. w.

357—Nursery Crop Production and Management (4). Operations, methods used by wholesale, retail, landscape nurseries. Field problems, observational trips. Prerequisites: 233 and 234. w. even years.

362—Greenhouse Crops Production (4). Production management decision and commercial culture of the major floriculture crops. Prerequisite: 266 or instructor's consent. w, odd years.

370—Small Fruit and Vegetable Production (3). Emphasizes production, management and marketing practices for small fruit and vegetable crops. Prerequisites: 100, 233, and 234. w, odd yrs

390—Internship in Plant Science (1-3). Combines study, observation, and employment with an industry or government agency in area of agronomy or horticulture. Written and oral reports and faculty evaluation. Prerequisites: 60 hours including two courses in department and instructor's consent.

400—Problems in Plant Science (1-3). Advanced studies not expected to terminate in thesis. Problems arranged with individual faculty member in specific matter area. Prerequisite: instructor's consent. f,w,s.

401—Topics in Plant Science (1-4). Instruction in specific subject matter areas in agronomy or horticulture. Prerequisite: graduate standing and instructor's consent. f,w,s.

409—Weed Science Research Principles and Techniques (3). Discussion of herbicide physiology and fate in the environment, current development in weed science theory and methodology, and application of analytical procedures in weed research. Prerequisite: 209 and graduate standing. alt. f, odd yrs.

410—Seminar (1). In-depth development of advanced aspects of agronomy and horticulture through reviews of results of research in progress and current scientific publications. Graded on A/F or S/U basis dependent on section.

415—Advanced Plant Physiology (3). Advanced course in the physiology of plant growth and development. Discussion of current and classical studies in plant physiology with emphasis on responses to environmental variation. Prerequisite: 315 or 317 or equivalent. alt. w, even years.

416—Transport and Metabolism of Plant Nutrients (3). (same as Plant Pathology 416). Current and classical concepts in (1) transport of nutrients across plant root membranes and translocation of nutrients in the plant, (2) metabolism and function of plant nutrients and (3) stress caused by mineral imbalances and/or pathogens. Prerequisites: 315 or 317, and 313, and Biochemistry 270 or equivalent. alt. f, odd years

425—Advanced Plant Breeding (3). Plant Science 425 will explore theoretical and applied topics in plant breeding through an examination of classical and current literature. The course will integrate convetional breeding concepts and methodology with current biotechnical approaches to plant improvement. Prerequisite: 225, 325, 330 and Statistics 395. alt. w, odd years.

440—Applied Quantitative and Statistical Genetics (3). Estimation of genetic effects using means and variances, diallel analysis, environmental stability responses, index selection, and gain from selection. Prerequisite: 330, Statistics 385, 395, Animal Science/Biological Sciences 423, or equivalent. alt. w, even years.

450—Nonthesis Research (1-9).

490—Thesis Research (1-10). Original investigations in agronomy and horticulture in support of thesis for master's and doctoral canidates. Graded on a S/U basis only.

Ancient Studies Area

107 Swallow (573) 882-4731

FACULTY

Larry Okamura, chair, associate professor of history, PhD, University of Michigan

John H. Kultgen, professor of philosophy, PhD, University of Chicago

Ralph M. Rowlett, professor of anthropology, PhD, Harvard University

Kathleen Warner Slane, professor of art history and archaeology, PhD, Bryn Mawr College

Daniel Hooley, associate professor of classical studies, PhD, University of Minnesota

David Schenker, associate professor of classical studies, PhD, University of California at Berkeley

Steve Friesen, assistant professor of religious studies, PhD, Harvard University

The interdisciplinary minor in ancient studies is shared among the departments of anthropology, art history and archaeology, classical studies, history, philosophy and religious studies; it is offered at both the MA and PhD levels. Graduate students enrolled in one of these departments should apply formally to the current chair of the ancient studies committee.

CURRICULUM: The minor is taken in addition to the courses required by the student's major department; it usually constitutes between one-quarter and one-third of the graduate course work. For the MA degree, a minimum of nine hours of courses from at least two departments outside the student's major department is required. For the PhD degree, a minimum of 24 hours (including the work for the MA) from at least two departments outside the student's major department is required; these must include at least one course at the 400-level in each of two related departments.

Animal Sciences

College of Agriculture, Food and Natural Resources
S108 Animal Sciences Center (573) 882-8336

FACULTY

George Wm. Jesse, unit leader and department chair, professor, PhD, University of Missouri-Columbia. Swine production and management.

William R. Lamberson, director of graduate studies, professor, PhD, University of Nebraska. Animal breeding and genetics.

Gary L. Allee, professor, PhD, University of Illinois. Swine nutrition.

Ronald L. Belyea, professor, PhD, Cornell University. Dairy nutrition.

Billy N. Day, professor, PhD, Iowa State University. Reproductive physiology-swine.

Jeffre D. Firman, professor, PhD, University of Maryland. Poultry physiology and nutrition.

H. Allen Garverick, professor, PhD, Purdue University. Reproductive physiology-dairy.

Duane Keisler, professor, PhD, West Virginia University. Reproductive physiology-sheep.

Monty S. Kerley, professor, PhD, University of Illinois. Fermentation biochemistry.

Rex R. Ricketts, professor, PhD, University of Missouri-Columbia. Commercial agriculture.

R. Michael Roberts, professor, PhD, Oxford University. Molecular biochemistry.

Michael F. Smith, professor, PhD, Texas A&M University. Reproductive physiology-beef cattle.

Barry J. Steevens, professor, PhD, Oklahoma State University. Extension-dairy production and management.

Trygve L. Veum, professor, PhD, Cornell University. Swine nutrition.

James E. Williams, professor, PhD, West Virginia University. Ruminant nutrition.

Kevin L. Fritsche, associate professor, PhD, University of Illinois. Lipid nutrition, immunology.

David Ledoux, associate professor, PhD, University of Florida. Mineral metabolism.

Wayne E. Loch, associate professor, PhD, University of Missouri-Columbia. Horse production and management.

David Patterson, associate professor, PhD, Kansas State University. Extension beef cattle production.

Randall Prather, associate professor, PhD, University of Wisconsin-Madison. Reproductive physiology/ molecular biology.

James Spain, associate professor, PhD, Virginia Polytechnic Institute and State University. Dairy nutrition.

Don Spiers, associate professor, PhD, Michigan State University. Environmental physiology.

Kathy Sharpe Timms, associate professor, PhD, University of Tennessee. Infertility and endometriosis.

Eric Berg, assistant professor, PhD, Purdue University. Meat quality and compositon.

Marcia Carlson, assistant professor, PhD. Extension-swine nutrition.

William Herring, assistant professor, PhD, University of Georgia. Extension-beef cattle genetics.

Christopher Kaiser, assistant professor, PhD, Colorado State University. Beef cattle production systems.

Mathew Lucy, assistant professor, PhD, University of Florida. Molecular endocrinology.

K.C. Olson, assistant professor, PhD. Commercial Ag Beef nutrition.

Tim Safranski, assistant professor, PhD, University of Missouri-Columbia. Extension-swine breeding and genetics.

DEGREES: MS and PhD in animal sciences

A student may pursue any of the following areas of concentration: nutrition, reproductive physiology, genetics, molecular biology, environmental physiology, or production and management. These programs are designed to prepare students for advanced professional careers in academia (teaching, research and extension) and industry. Animal sciences, a broad and rapidly changing field, demands a breadth of training. Accordingly, graduate programs include course work in biochemistry, genetics, management, microbiology, molecular biology, nutrition, physiology, statistics and computer science.

The department cooperates with scientists in government, industry and at other state and international institutions, with national and local firms and with the professional associations for these groups.

Facilities for graduate research are in a four-acre Animal Sciences Center, which includes offices and laboratories, small- and large-animal research units, a climatic laboratory, surgery unit and departmental library containing scientific journals, periodicals and other references in animal sciences. In close proximity are the research farms for beef cattle, dairy cattle, swine, turkeys, sheep and horses.

Opportunities to gain practical experience in teaching, research and extension are provided. Fellowship, scholarship and research assistantships are available on a competitive basis to qualified students.

Additional information can be obtained from Dr. William Lamberson, director of graduate studies, S108 Animal Sciences Center, Columbia, MO 65211.

MASTER'S DEGREE: To be considered for acceptance into the MS degree program, an applicant must:

- meet Graduate School admission requirements,
- have a BS in animal sciences or related area with a 3.0 (A=4.0) cumulative GPA,
- have a GRE verbal and quantitative total score of 1000 minimum,
- provide three letters of reference and
- have a TOEFL score of at least 500, if an international student whose native language is not English.

The standard master's degree program consists of a minimum of 30 hours of graduate credit (to include a minimum of 24 hours of formal graduate courses, plus a minimum of six hours of 490 research) and an approved thesis based upon original research. In addition, the principal courses required of MU undergraduates majoring in each area of concentration must have been completed. When necessary, students may enroll in graduate and needed undergraduate courses simultaneously. However, no more than two 300-level animal sciences courses can contribute to the program of study.

The requirements for an MS degree are generally completed within a 24-month period.

DOCTORAL DEGREE: For consideration of acceptance into the PhD degree program, an applicant must:

- meet the admission requirements of the Graduate School,
- have an MS degree in animal sciences or related area,
- have a GRE verbal and quantitative total score of 1000 minimum,
- provide three letters of reference, one of which must be from a previous academic adviser and
- have a TOEFL score of 500 minimum, if native language is not English.

The number of credit hours in formal course work and in research varies with the student's background, training interests and the nature of

the research. A dissertation based upon original research is required of each candidate.

Completion of requirements for a PhD degree is generally expected within three years after admission to the PhD program.

COURSES

200—Problems (1-5). Library and laboratory study of assigned problems in animal breeding, nutrition, physiology or production and management. Planning, conduction and reporting to be in consultation with instructor. Prerequisite: instructor's consent. f,w,s.

202—Principles and Application of Animal Nutrition (5). Fundamentals of animal nutrition and their application to livestock industry. The laboratory portion of the course will be devoted to ration formulation, feed evaluation and identification. Prerequisite: Biochemistry 100 or Organic Chemistry 205 or 210 and Mathematics 10 or equivalent. f.

204—Principles of Meat Science (3). (same as Food Science and Nutrition 204). Study of the principles involved in the conversion of living animals to meat and by-products; efficient utilization of meat as a food. Laboratory stresses the application of scientific principles in the meat industry. Prerequisite: one course in Biology. w.

213—Genetics of Agricultural Plants and Animals (3). (same as Plant Science 213). Concepts of molecular, transmission, and population and quantitative genetics. Special emphasis given to breeding and biotechnological applications in plant and animal agriculture. Prerequisites: Biological Sciences 1, 2 or 10, Mathematics 10. w. 9 weeks.

231—Principles of Dairy Foods Science (3). (same as Food Science & Human Nutrition 231). Technology, chemistry and microbiology related to milk and its transformation into fluid milk products, fermented dairy foods and spreads. (2 hours of lecture and two hours of laboratory per week.) Prerequisite: organic chemistry. f.

254—Physiology of Domestic Animals (5). Basic concepts of physiology and anatomy as related to domestic animals are covered in lecture and laboratory classes. Enrollment limited. Prerequisites: Biology 1 and 2, or 10; Chemistry 31, 32; Organic Chemistry and/or Biochemistry. f.

275—Advanced Livestock Selection and Evaluation (2). Evaluation and selection of breeding and market animals of four farm species (swine, beef cattle, sheep, horses); emphasis on production records and carcass data. Prerequisite: 105. w.

285—Advanced Dairy Cattle Judging (2). Continuation of 115. Includes field trips. Prerequisite: 115. w.

300—Problems (1-6). Current problems in animal breeding, nutrition, livestock production and management, meats. Assigned topics. In some cases student may undertake a project by outlining objectives, planning work, keeping records and summarizing results in written report. f,w,s.

301—Topics (1-4). Various courses offered on a preliminary basis to determine need for such offering prior to submission as a numbered course. Various topics, credit arranged. Instructor's consent.

302—Monogastric Nutrition (3). (same as food science and human nutrition and nutrition 302). Principles of nutrition, feed formulation and recent research in poultry feeding. Prerequisites: 202, Biochemistry 193 recommended. Letter grading only. w.

304—Physiology of Reproduction (3). Principles of animal reproduction with emphasis on endocrine control of reproductive processes. Prerequisites: Biology 10, Animal Science 254 or equivalent. f,w.

305—Beef Production and Management (3). Systems of beef production: breeding, feeding, management of commercial and purebred beef cattle. Prerequisites: Animal Science 65, 202 and 323. Non majors: Animal Science 11. Plant Science 273 and Animal Science 304 are recommended.

315—Advanced Dairy Production (3). Applied dairy science; emphasis on nutrition and management; herd health, labor-saving equipment, buildings, quality products, organization of dairy enterprise, business and economic aspects. Prerequisites: Animal Science 65 and 202 or equivalent. f.

323—Applied Livestock Genetics (2). Genetic principles applied to improvement of farm animals. Covers selection, prediction of genetic merit and mating systems. Prerequisite: Animal Sciences 213. 6 wks. w.

325—Horse Production (3). Systems of horse production: breeding, feeding and management of horses. Prerequisites: Animal Science 202, 213, 304 and 323.

332—Ruminant Nutrition (3). Physiology, chemistry, microbiology and pathology of ruminants. Emphasizes the digestion, absorption, metabolism and utilization of nutrients. Prerequisites: 202.

345—Sheep Production and Management (3). Systems of sheep and wool production: breeding, feeding, management of commercial and purebred sheep. Prerequisites: Animal Science 202 and 304. w.

355—Swine Production (3). Systems of pork production: breeding, feeding, management of commercial and purebred swine. Prerequisites: Animal Science 202 and 213 and 304 and 323. f.

375—Poultry Production (3). Principles of housing systems, nutrition, management, business and production of commercial chickens and turkeys. Prerequisites: 65, 202. w.

384—Reproductive Managment (3). Reproductive management of cattle, swine and sheep; estrous synchronization; artificial insemination; embryo development and transfer; assisted reproductive technologies. Prerequisites: junior standing and Animal Science 304. f.

390—Internship in Animal Science & Technology (1-12). Off-campus training to develop technical skills and understanding of an area of animal science. Written reports required. Prerequisites: junior standing, two 300-level Animal Science courses and instructor's consent. Graded on an S/U basis only.

400—Problems (1-6). Advanced independent studies in fields not directly related to thesis or non-thesis degree research program. Prerequisites: graduate standing and instructor's consent.

401—Livestock Production and Management Research Methods (3). Techniques of experimentation, with application to livestock production and management. Exercises in methods of planning, conducting, analyzing, evaluating and reporting research. Prerequisites: graduate standing, Statistics 395 or equivalent or instructor's consent. s, even yrs.

410—Seminar (1). Critical consideration of research and other selected subjects in animal breeding, animal nutrition, and livestock production and management. Students indicate at enrollment the area of study. f,w.

413—Reproductive Biology Seminar (1). (same as Biochemistry 413).

420—Endocrinology (3). (same as Biological Sciences 420). Hormones of pituitary and endocrine glands; special reference to influence on growth, reproduction, milk secretion. f.

423—Genetics of Populations (4). Introduction to quantitative genetics with application to animal and plant breeding. Prerequisite: Statistics 395.

427—Recent Advances in Environmental and Endocrine Physiology (1). Seminar. Presentation, discussion, and critical evaluation of current status of selected topics in environmental and endocrine physiology. f,w.

431—Nutritional Biochemistry of Lipids (3). (same as Food Science and Human Nutrition 431). Current concepts in the nutritional regulations of lipid metabolism. Emphasis on integrating information and interpreting current research data. Prerequisites: Biochemistry 270 and 272.

432—Ruminant Nutrition (3). (same as Nutrition 432). Physiology, chemistry, microbiology, pathology of ruminants. Emphasizes digestion, absorption, metabolism, utilization of nutrients. Lecture, laboratory, assigned readings. Prerequisite: 402 or equivalent. alt. w, odd years.

433—Gamete and Embryo Development (3). A classical and molecular approach to spermatogenesis, oogenesis, fertilization and preimplantation development in the domestic species. Prerequisites: 304 or Biological Sciences 335 or equivalent. f, even yrs.

434—Gonadal Function (3). (same as Vet Biomed Science 434). Prerequisite: Animal Science 304 (Physiology of Reproduction) or equivalent, a course in endocrinology, and biochemistry or cell biology.

435—Physiology of Cell Preservation (3). Comparative physiological and biophysical changes occurring in cells, especially in spermatozoa, ova and bacteria, which are exposed to various storage environments including cryogenic temperatures and dehydration. w.

437—Environmental Physiology (3). Principles of environmental physiology and animal adaptation with emphasis on mechanisms of temperature regulation and related nutritional and metabolic-hormonal functions. w.

438—Nutrient Regulation of Gene Expression (3). (same as Nutrition, Animal Science & Biochemistry 438). This second semester of the graduate nutritional sciences core curriculum will cover nutritional biochemistry of minerals and on research literature, with an emphasis on in-depth coverage of several minerals that illustrate emerging themes in mineral nutritional biochemistry and nutrient regulation of gene expression. The course will be taught in tutorial format. Prerequisites: upper division nutrition course, Biochemsitry 270 and 272 and first semester of Graduate Nutrition core curriculum.

440—Topics in Animal Science (1-99). Prerequisites: graduate standing and instructor's consent.

442—Vitamins and Minerals (4). Designed to provide students with an understanding of the chemical, metabolic, and functional role of vitamins and minerals in nutrition. While the primary focus will be on animals, comparative aspects to human nutrition will be discussed. Prerequisites: 202, Biochemistry 270, or equivalent.

450—Research (1-99.9). Investigations in animal breeding, animal nutrition, livestock production and management. Written report required.

452—Food Intake Regulation (2). Giving an overview of major physiological processes that control food intake. Prerequisites: graduate level courses in physiology, and biochemistry, or instructor's consent. w, odd years.

472—Amino Acid Metabolism (2). An indepth study of amino acid metabolism and their relationship to animal nutrition. Prerequisites: Biochemistry 270, 272. w. even yrs.

490—Research (1-99). Investigations in animal breeding, animal nutrition, livestock production and management. Thesis required. Graded on a S/U basis only.

Anthropology

College of Arts and Science
107 Swallow Hall (573) 882-4731

FACULTY

Samuel D. Stout, chair, professor, PhD, Washington University. Biological anthropology, bone histology, bone physiology, paleopathology, forensic anthropology.

R. Lee Lyman, director of graduate studies, professor, PhD, University of Washington. Archeology, faunal analysis, taphonomy; Northwest.

Robert A. Benfer, professor, PhD, University of Texas. Bioarcheology, physical anthropology, archeology, methods, statistics; Peru, Mexico.

Louanna Furbee, professor, PhD, University of Chicago. Linguistic and cognitive anthropology,

language and culture; Mesoamerica (Maya), Andes, Chiwere (Siouan).

Peter M. Gardner, professor, PhD, University of Pennsylvania. Anthropology of knowledge, cognition, foraging adaptations, gender, history of anthropology; India, Subarctic.

Michael J. O'Brien, professor, PhD, University of Texas. Theory and method, evolution; Midwest.

Deborah M. Pearsall, professor, PhD, University of Illinois at Urbana-Champaign. Archeology, ethnobotany, phytolith analysis; South America, Caribbean, Midwest United States.

Michael C. Robbins, professor, PhD, University of Minnesota. Cultural anthropology, psychological anthropology, substanceuse, mathematical anthropology.

Ralph M. Rowlett, professor, PhD, Harvard University. Prehistory, ethnohistory, method and theory, lithic and TL analysis; Europe, Old World.

Robert F. G. Spier, professor emeritus, PhD, Harvard University. Cultural anthropology, technology; old world.

H. Clyde Wilson, professor emeritus, PhD, University of California-Los Angeles. Cultural anthropology; North America.

W. Raymond Wood, professor, PhD, University of Oregon. Archeology, ethnohistory; North America.

Mark V. Flinn, associate professor, PhD, Northwestern University. Evolutionary theory, human mating systems, parent-offspring relationships, time allocation methods, childhood stress, radioimmunoassay of hormones; Caribbean.

Lisa Sattenspiel, associate professor, PhD, University of New Mexico. Disease in human populations, demography, ecology, mathematical modeling, population genetics.

Carol V. Ward, associate professor, PhD, Johns Hopkins University School of Medicine. Hominoid evolution, functional anatomy, mechanics of locomotion, Micene hominoids, east African hominids; Africa.

Kathryn Coe, assistant professor, PhD, Arizona State University. Health, chronic disease, community mobilization, kinship, art, evolutionary theory; South America, southwest North America.

Gery W. Ryan, assistant professor, PhD, University of Florida. Medical and health anthropology, ethnographic decision making, qualitative and quantitative methods; Latin America, Africa.

DEGREES: MA and PhD in anthropology

The master's degree program of study is designed to provide broad training in anthropology. At the doctoral level, the student pursues individual, specialized study.

The doctoral candidate normally specializes in one of the four recognized subfields of anthropology or, in consultation with a doctoral program committee, chooses an area of specialization that either cuts across some of the four recognized divisions or includes some area outside traditional anthropology. Traditional areas of specialization currently offered include:

- Cultural anthropology, ethnohistory, technology, social anthropology, theoretical anthropology, psychological anthropology.
- Biological anthropology, ethology, forensic anthropology, skeletal biology, human osteology, human evolution, demography, epidemiology.
- Archaeology, chronology, materials research, sociocultural interpretation, zooarchaeology, paleoethnobotany, experimental archaeology.
- Linguistic anthropology, cognitive anthropology, descriptive linguistics, sociolinguistics, enthnolinguistics.

The department's Museum of Anthropology provides some opportunities for museum-oriented studies. All graduate tracks emphasize the development of logical reasoning and the ability to write clearly and concisely.

Departmental research facilities/collections include a paleoethnobotanical laboratory, a comparative faunal collection, a thermoluminescence laboratory, a bone-histology laboratory, extensive holdings of archaeological and skeletal materials from Missouri and ethnographic specimens from many parts of the world. Off-campus research facilities include the Museum Support Center on the edge of campus, the Lyman Archaeological Research Facility in Miami (one hour away), and the Southeast Missouri Archaeological Research Center in Naylor, Mo. (five hours away).

Geographical areas of current departmental research include, beyond Missouri, the Northwest (archaeology), the Great Plains (archaeology and linguistics), the Gulf Coast (cultural anthropology), the Mississippi River Valley (archaeology), Switzerland (archaeology), Ecuador (archaeology), Peru (archaeology, biological anthropology and linguistics), and Dominica (biological and cultural anthropology). Teaching, research and student assistantships, fellowships and scholarships are available to qualified graduate students on a competitive basis. Applications for financial assistance should accompany application for admittance to the graduate program in anthropology and should be submitted by January 1 each year.

Address inquiries to the Department of Anthropology, 107 Swallow Hall, Columbia, MO 65211. http://www.missouri.edu/~anthwww.

MASTER'S DEGREE: Acceptance into the graduate program in anthropology is not limited to students with undergraduate degrees in anthropology. However, an entering student should have had introductory courses in cultural anthropology, archaeology, linguistics and biological anthropology. Students with deficient backgrounds can be admitted as provisional candidates and must make up their deficiencies without graduate credit during the first year of graduate study. In addition, all students are required to have at least one course in statistics. The department offers a course in statistics geared toward anthropological analysis.

The basic standards for admission are a 3.25 GPA (A=4.0) for the last 60 hours of undergraduate courses and a score of 1000 on the GRE (verbal and quantitative). These requirements may be waived in exceptional cases.

A program tailored to each student's educational objectives is planned by the student and the advisory committee of at least three members. The course of study must include at least one graduate-level course in each of the four subfields of anthropology. After 27 hours of graduate courses, the student must pass an MA examination.

A thesis, for a maximum of six hours of credit, is required for the master's degree.

DOCTORAL DEGREE: To be accepted into the doctoral program in anthropology, a student must show superior performance on the aptitude test of the GRE, have a master's degree and a 3.5 or higher GPA in previous graduate work. Further, a faculty member who is a member of the doctoral faculty must agree, as a condition of admission, to accept the student as a PhD advisee. These qualifications apply to all applicants, including those with an MA degree from this department.

Students must pass an oral qualifying examination during their first semester of graduate work. The examination is administered by the student's doctoral program committee, adviser and two members of the department representing at least two subfields of anthropology. After students successfully qualify for the PhD program, their status is "applicant for the PhD."

The PhD degree is primarily oriented toward research competence. Therefore, the student is judged on research promise and ability. The objective of course work is to produce an anthropologist with some competence in all fields and a special competence in a chosen field for purposes of teaching, research and evaluation of others' research.

The student's program committee is responsible for developing the program of study that shall include at least one foreign language appropriate to the student's area of specialization. No set number of hours is mandated, but most students amass 48 to 60 hours of graduate study beyond the MA.

PhD candidates are required to attain teaching experience. This can be accomplished either by serving as a departmental graduate teaching assistant for one semester (stipends for which are awarded competitively) or by assisting a faculty member in the preparation and teaching of one course.

An applicant for the PhD normally takes a comprehensive examination at the end of the second or third year of the program. After students successfully pass the comprehensive examination, their status is "candidate for the PhD."

The PhD in anthropology is awarded after an accepted dissertation has been submitted and defended successfully before the candidate's committee.

All application materials should be filed by January 1 for acceptance in the fall semester.

COURSES

201—Topics in Anthropology (1-3). Problems, topics, issues or review of research in any area of anthropology and/or experimental development of new content areas. May be repeated to a maximum of 9 hours. Prerequisite: instructor's consent.

215—Anthropology and the Arts (3). This course considers visual and auditory arts in cross- cultural perspective. Genres include: graphic and plastic arts, poetry, music, and dance. Examples are selected from non- Western societies from various world regions and time periods. Prerequisite: sophomore standing or instructor's consent. Taught every third semester.

220—Plants and People (3). Explores the present and past interactions between people and the plant world, covering use of plants as foods, medicines, and in rituals, and reviewing the origin of major food plants. Prerequisites: sophomore standing.

229—Cultures of Asia (3). Survey of peoples and cultures

of Asia; emphasis on native societies of area. Prerequisites: sophomore standing or instructor's consent.

236—North American Indian Culture (3). Comparative study of American Indians north of Mexico, emphasizes eastern United States. Prerequisites: 153 or

237—Native American Religions (3). (same as Religious Studies 237). Investigation of religious lives of the native peoples of the Americas through cultural contact with modernity. Perspectives based on historical, anthropological and native texts. Prerequisite: Religious Studies 131 or sophomore standing.

240—Aztec, Maya, and Inca Civilization (3). Origin of native Americans and development of American civilizations emphasizing Aztecs, Mayas, and Incas; rise of these civilizations known from archeology early European and early native American accounts, and the condition of the descedants today. Prerequisite: sophomore standing.

254—Exploration in Human Biology (3). A general survey of human biology, focusing on the development of the individual from infancy to adult and the biology of human populations. Prerequisites: one course in Anthropology or Biology. Biological Sciences credit only.

260—The Third World: An Anthropological Perspective (3). (same as Peace Studies 261). Consideration of problems in developing nations—neo-colonialism, peasant revolutions, over- population and under-industrialization—in the context of cultural change. Prerequisites: junior/senior standing.

261—Cultures of Europe (3). Examines ethnic, linguistic, and folk cultural backgrounds of contemporary Europe and the articulation of local sociocultural units with national society and culture. Prerequisites: sophomore standing or instructor's consent.

265—Male and Female (3). Comparative anthropological findings of the male and female in politics, subsistence, art, etc. in primitive, peasant and modern cultures. Cultural and biological theories about sexually defined roles. Behavioral evolution of monkeys, apes, humans. Prerequisite: 3 hours behavioral science.

270—Culture as Communication (3). (same as Communication 270, Linguistics 270). Study of the influence of culture on communication processes. Examines topics as the impact of values, languages, adn nonverbal behavior on intercultural interaction. Prerequisites: junior or senior standing.

275—Anthropology and the Concept of Race (3). (same as Black Studies 275). The concept of race is deconstructed by examining models of human origins, genetics and racist ideas about crime, intelligence and achievement. Paper and examination required. Prerequisite: sophomore standing.

280—Seminar in Anthropology (3). Readings, discussions, and problems in the integration of the subfields of anthropology through theory and examples. Prerequisites: Anthropology major, at least second semester junior, or instructor's consent.

284—American Folklore (3). (same as English 285). Regional and ethnic American folklore, with emphasis on analysis of folklore in context. Book reports and two analytical papers based on student field research required.

285—Undergraduate Research (2-8). Research approved by and under the direction of a departmental faculty member. Prerequisite: 186 or instructor's consent.

290—Culture and Thought (3). Beliefs and world view of selected cultures; cosmology, myth, folk-tale, legend; magic, religion, science considered as aspects of human behavior; relation of beliefs to social structure, cognitive development, and the human cycle. Prerequisites: junior/senior standing or instructor's consent.

298—Honors in Anthropology (3). Individual study and research leading to Honors in Anthropology. In consultation with instructor, student works on Honors Thesis. Anthropology majors only. Prerequisites: junior or senior standing; Honors level GPA, instructor's consent.

299—Honors in Anthropology (3). Continuation of 298. Prerequisites: junior/senior standing; Honors level GPA, instructor's consent.

305—Maya Hieroglyphs and Thought (3). Introduction to the writing system of the ancient Maya and decipherment of hieroglyphic texts as an avenue to understanding important cultural themes of ancient Mayan life: religion, politics, composition of ruling families, scientific knowledge, prophesy, and agricultural activity. Prerequisites: junior standing or instructor's consent.

308—Historical Linguistics (3). (same as Linguistics 308). Methods of tracing the history of languages by glottochronology, and by comparative and internal reconstructions; cultural and linguistic implications of such reconstructions and of areal linguistics. Prerequisites: junior/senior standing or instructor's consent.

309—Information Technology in Anthropology (3). After an introduction to microcomputers and their operating systems, major applications will be taught, followed by individually guided study of anthropological applications. Prerequisites: 6 upperclass hours of Anthropology or instructor's consent.

310—Ethnographic Studies of Selected Cultures (3). Specific content varies with student interest, faculty availability. Will concentrate on peoples and cultures of one area such as East Asia, South Asia, Africa, North America, Mesoamerica, Oceania, Europe. Amplifies ethnographic knowledge gained in lower-level survey courses. Prerequisites: senior/graduate standing or instructor's consent.

312—Gender, Language, and Communication (3). (same as Communication and Linguistics 312). Relationship among gender, language, nonverbal communication, and culture. Prerequisite: junior standing or departmental consent.

320—Evolutionary Medicine (3). Principles of modern evolutionary theory are applied to medical problems. Topics include: function of symptoms (fever, nausea, etc.); strategies of pathogens; senescence; cancer; phylogenetic constraints; mental disorders. Ideas will be actively discussed in class. Prerequisites: lower level course in Biology or Biological Anthropology, junior/senior standing or instructor's consent.

321—Expert Systems (3). (same as Sociology, Veterinary Medicine & Surgery and Computer Science 321). Introduction to the use of expert systems, designed for graduate students from any department. Students create prototype expert systems under close supervision by faculty experts. Prerequisite: departmental consent.

322—Demographic Anthropology (3). The major topics considered in this course are basic demographic analysis, including life tables, models for population growth and stable population theory; fertility analysis; disease and fertility; disease in human populations; and paleodemography. Prerequisites: Math 10 and junior/senior standing or instructor's consent.

323—Medical Anthropology (3). Cross-cultural study of belief systems concerning health and illness, practices of diagnosis and treatment, and roles of patients and practitioners. Several "non-Western" health care systems are studied in detail. Prerequisite: junior or senior standing or instructor's consent.

324—Preindustrial Technology (3). Technological pursuits of nonliterate peoples: stone working, basketry, pottery, metallurgy, etc. Description, analysis of technical, economic, social aspects. Prerequisites: junior/ senior standing or instructor's consent.

325—Political Anthropology (3). (same as Peace Studies 326). Cross-cultural analysis of the structure of power and authority; relationship of political processes to other aspects of culture; special reference to non-western societies. Prerequisites: junior/senior standing or instructor's consent.

328—Psychological Anthropology (3). Examines cross-cultural approaches to the study of perception, cognition, and personality; methods for gathering and validating data; examples from non-Western societies. Prerequisites: Psychology 1 or instructor's consent.

332—Comparative Social Organization (3). Cross-cultural comparison, analysis of social structures. Role of kinship, age, sex, locality, economics, religion and other factors in determining relationships between individuals and groups in non-literate societies. Prerequisites: 153 or instructor's consent.

333—Museological Process (3). Traces the processing of museological materials and collection from their first entry into the museum through their accessioning and stabilization until the materials are used in exhibits and/or placed in reserve storage. Taught every fourth semester. Prerequisite: sophomore standing or higher.

336—Paleoethnobotany (3). Application of ethnobotanical approaches in archaeology; techniques to recover and interpret floral remains (macroremains, phytoliths, pollen); research questions in ethnobotany; integration of ethnobiological and archaeological data. Critique of original works in the field emphasized. Prerequisites: junior/senior standing or instructor's consent.

337—Zooarchaeology (3). Survey of specialized techniques for archaeological/faunal analysis, including zoo archaeological sampling, taphonomy study of paleoecology, and recognition of domestication. Prerequisites: junior/senior standing or instructor's consent.

340—North American Archaeology (3). Ancient peoples and development of American Indian culture. Prerequisites: 152 or 240.

341—Archaeology of South America (3). Development of culture in South America from the Pleistocene to European contact. Prerequisites: 152, or junior/senior standing.

342—Field Methods in Archaeology (1-8). Techniques of archaeological excavation; field surveying, recording, care and interpretation of materials. Prerequisites: 142 or equivalent, and instructor's consent.

343—Environment and Archaeology (3). Study of quaternary environments and cultural systems. Focuses on North American records emphasizing climate and biologic components of regional ecosystems; regional environmental reconstruction. Prerequisite: 152 (for non- majors, Geology 127 or equivalent).

344—Prehistory of Mesoamerica (3). Covers the archaeology and prehistory of Mesoamerica (Mexico and Northern Central America). Emphasis on archaelogical evidence for development of human societies from late Pleistocene hunting bands to complex agricultural civilizations encountered by Europeans in 1500s.

346—Language and Culture (3). (same as Linguistics 346). Interrelations between language, thought, culture, and society; role of language in cognition; methods and concepts of linguistics in cultural analysis. Prerequisite: 154 or equivalent

347—Mesolithic, Neolithic, & Bronze Age Archaeology (3). Analysis of both hunter-gatherer and food-producing prehistoric sociocultural systems in western Eurasia and adjacent areas from the end of the Pleistocene until the development of iron metallurgy. Includes the symbolic material of these periods. Prerequisites: junior/senior standing or instructor's consent.

348—Asiatic Prehistory (3). Survey of the prehistory and early cultures of Asia excluding the Near East. Emphasis on Northern Asia, China, Japan, South and Southeast Asia and Oceania. Prerequisites: junior/senior standing or instructor's consent.

349—Topics in Anthropology (3). Problems, topics, issues, or review of research; experimental development of new contact areas. Specific content varies depending on needs of faculty or students and will be announced in advance. Prerequisite: instructor's consent.

350—Special Readings in Anthropology (1-99). Directed readings in ethnology, linguistics, archaeology, or physical

anthropology not leading to thesis. Prerequisites: two courses in Anthropology and instructor's consent.

352—History of Archaeology (3). Growth of archaeology worldwide since AD 1700. Emphasis include intellectual and theoretical developments, field and laboratory techniques, and major figures in the history of the discipline. Prerequisites: 152 or instructor's consent. alt, w.

355—Human Skeletal Identification and Analysis (5). Students interested in archaeology, physical anthropology, and law enforcement will learn human osteological methods of analysis applied to bioarchaelogical problems and modern forensic techniques for personal identification. Prerequisite: 150 or instructor's consent.

356—Anthropology of Knowledge (3). Examines appraches associated with cultural knowledge and ways of knowing and meaning. It considers them from the point of view of the achievement of cultural understanding and of obtaining theoretical explanation selected persistent issues in interpretive and cognitive frames. Prerequisite: junior standing.

358—Celtic and Iron Age Archaeology (3). Analysis of the pre-and protohistoric sociocultural systems of the Celts and other iron-using tribal cultures of western Eurasia from the inception of an iron based technology until the full historic period. Includes the symbolic material of these cultures. Prerequisites: junior/senior standing or instructor's consent.

360—Stone Artifact Analysis (3). Theory, methods, and techniques of studying lithic artifacts and deriving culturally meaningful interpretations. Emphasizes flaked artifacts. Includes physical examination, manufacture and experimentation with stone tools. Prerequisite: 3 hours Archaeology or Anthropology. Protective handgear and eyewear required.

362—Cultural Evolution and Change (3). The processes of culture: innovation, diffusion, integration, patterning, acculturation and others, examined in literate and non-literate contexts. Prerequisites: 153 or instructor's consent.

363—Theories in Social and Interpretive Anthropology (3). Critical examination of selected theories and methods concerning human society and psyche. Prerequisites: 153 or instructor's consent.

364—Human Origins (5). History and theory in the study of human paleontology. Prerequisites: 150 or instructor's consent. Biological Science credit only.

365—Skeletal Biology (3). This course is designed to provide students advanced and indepth training in skeletal biology. Basic bone biology will be studied and advanced methods of skeletal analysis applicable to forensic anthropology and bioarchaeology will be explored. Prerequisites: 355 or equivalent background in osteology and/ or anatomy. Biological Science credit only.

366—Human Biological Variation (3). Human biological variation both among and within living populations. Evolutionary, genetic, ecological, demographic and especially cultural factors which contribute to biological variation. Prerequisites: 150 or Biology 1. Biological Science credit only.

367—Ethnographic Methods (3). Relation of problems to techniques; surveys techniques of gathering data; discusses their limitations and potentials. Prerequisites: 9 hours Anthropology or instructor's consent.

368—Old World Prehistory (3). Beginnings of culture in the old world through the early Iron Age. Prerequisites: 152, or instructor's consent.

370—Practical Phonetics for Fieldwork (3). (same as Linguistics 370). Self-paced course using computer and tape recorded lessons from world's languages. Teaches practical articulatory and transcription phonetics. Weekly meeting with instructor to monitor progress, resolve questions. Prerequisites: junior standing or instructor's consent. f,w.

372—Techniques in Linguistic Analysis (3). (same as Linguistics 372, Romance Languages 372). Problems in analyzing data from various languages. Prerequisites: introductory course in Linguisitics or instructor's consent.

384—Special Themes in Folklore (3). (same as English 385). Intensive study in a selected area of folklore: folk narrative, folk song, myth, proverb, etc., folklore and literature, or the folklore of a particular group. May be repeated for a maximum of six hours. Prerequisite: instructor's consent for repetition.

384A—Themes in African-American Folklore (3). (same as English 385A and Black Studies 385A). Intensive study in a selected area of African-American Folklore: folk narrative, folk song, myth, proverb, etc., folklore and literature, or the folklore of a particular group. 385 and 385A may be repeated for a maximum of six hours with instructor's consent. Prerequisite: junior standing.

385—Research (2-8). Advanced research approved by and under the direction of a departmental faculty member. Prerequisites: junior/senior/ graduate standing and instructor's consent.

393—Field Methods in Linguistics (4). (same as Linguistics 393). Intensive training in collection and analysis of data taken from a native speaker of non-Indo-European language. Prerequisites: 6 hours Linguistics and instructor's consent.

400—Problems (1-99). Directed research not leading to thesis or dissertation. Prerequisite: departmental consent.

405—History of Anthropology (3). Growth of anthropological theories, method and perspectives: major figures and contributions in each subdiscipline. Prerequisites: graduate standing or instructor's consent.

420—Independent Reading in Preparation for Comprehensive Exam-PhD (1-8). Independent readings for Ph.D. comprehensives. Open only to Ph.D. candidates who have completed all but final semester of course work. Prerequisite: consent of major advisor.

436—Seminar in Anthropological Methods (3). Prerequisites: 9 hours Anthropology or instructor's consent. May repeat to 9 hours maximum.

437—Seminar in Ethnohistory (3). Introduction to the uses of historical documents and historical methods in anthropological research. Prerequisite: instructor's consent.

442—Field Problems in Archaeology (2-8). Prerequisite: 342.

443—Seminar in Theory and Methods in Archaeology (3). Application of theory and conceptual frameworks to archaeological studies drawn from both Old and New Worlds. Prerequisites: 152 or 153. May repeat to 6 hours maximum.

444—Seminar in Archaeological Research (3). Readings and critical evaluation of selected problems in archaeological research. Prerequisite: 12 hours Anthropology. May repeat to 9 hours maximum.

446—Seminar in Anthropological Linguistics (3). (same as Linguistics 446). Topics: Ethnolinguistics, linguistic prehistory, pidgin and Creole languages, linguistic theories and cultural and cultural analysis. French structural anthropology. May repeat for 9 hours maximum when content varies. Prerequisites: 308, 346 or instructor's consent.

449—Topics in Anthropology (3). Problems, topics, issues, or review of research; experimental development of new content areas. Specific content varies depending on needs of faculty or students and is announced in advance. Prerequisite: instructor's consent.

450—Non Thesis Research (1-99). Original research not leading to the preparation of a dissertation.

452—Seminar in Physical Anthropology (3-6). Readings and discussion concerning current problems in human and infrahuman primate evolution, with emphasis on taxonomy, morphology, and behavior. Prerequisites: 366 or instructor's consent.

461—Seminar in Psychological Anthropology (3). Focuses on developments in psychological anthropology, cross-cultural psychology. Special attention on cognition, perception, socialization, personality assessment, psycho-cultural change, psycho-linguistics, psychometrics, within cross-cultural contexts. Prerequisite: instructor's consent. May repeat to 6 hours maximum.

462—Seminar in Cultural Dynamics (3). Prerequisites: 326 or 362 or instructor's consent. May repeat to 6 hours maximum.

466—Seminar in Ecological Adaptation (3). Relationships and interactions between humans and their environments, with emphasis on the physical and cultural adaptations to environment. May repeat to 9 hours maximum. Prerequisites: 8 hours Anthropology & instructor's consent.

468—Seminar in Old World Archaeology (3). Intensive studies in application of anthropological concepts to problems in Old World archaeology and prehistory. Prerequisites: previous course in cultural anthropology and in Old World archaeology. May repeat to 12 hours maximum.

469—Seminar in Formal Anthropological Research Design (3). Methods of fitting statistical and formal research designs to quantitative and qualitative data discussed and illustrated, with research by participants. Prerequisite: introductory course in statistics. May repeat to 9 hours maximum.

484—Studies in Folklore (3). (same as English 485 and Religious Studies 475). Roots of folklore scholarship andmethodology; their evolution in modern approaches to the study of oral, traditional, verbal genres; and their performance in natural folk groups. Prerequisites: graduate standing or permission of instructor.

490—Research (1-99). Advanced work leading to thesis or dissertation. Prerequisite: consent of major advisor. Graded on a S/U basis only.

Art

College of Arts and Science
A126 Fine Arts (573) 882-3555
http://www.missouri.edu/~artwww/

FACULTY

William A. Berry, chair, professor, MFA, University of Southern California.

Brooke B. Cameron, director of graduate studies, professor, MA, University of Iowa.

Jerry D. Berneche, director of undergraduate studies, professor, MFA, Ohio University.

Robert F. Bussabarger, professor emeritus, MA, Michigan State University.

Larry Kantner, professor, EdD, The Pennsylvania State University.

Lawrence Rugolo, professor emeritus, MFA, University of Iowa.

Oliver A. Schuchard, professor, MFA, Southern Illinois University.

Frank H. Stack, professor, MA, University of Wyoming.

Jean M. Brueggenjohann, associate professor, MFA, Indiana University.

James H. Calvin, associate professor, MFA, Bowling Green University.

Bede Clarke, associate professor, MFA, University of Iowa.

William Hawk, associate professor, MFA, Washington University.

Adrienne W. Hoard, associate professor, MFA, EdD, University of Illinois.

Deborah Huelsbergen, assistant professor, MFA, Iowa State University.

Josephine M. Stealey, assistant professor, PhD, University of Missouri-Columbia.

DEGREE: MFA in art

The Department of Art, with studio courses in drawing, design, graphic design, ceramics, jewelry, painting, photography, printmaking, sculp-

ture and fibers, offers the master of fine arts degree. Students wanting to work toward the master of arts in education, doctor of education, or doctor of philosophy, with art as a teaching field, should address inquiries to the College of Education, 109 Hill Hall, Columbia, MO 65211.

Laboratory facilities are available in all media areas, and there are several individual graduate studios for students working in special problems courses.

The art department gallery schedules regular exhibitions that provide an opportunity for students to experience and relate to a variety of traditional and contemporary art exhibits. Art collections, which include the Museum of Art and Archaeology, are described in the **Museums and Collections** section of the catalog. Ellis Library has extensive and excellent holdings of books, periodicals and reference materials on art and art history.

The department offers a number of teaching assistantships to qualified graduate students working toward degrees of master of fine arts, master of education or doctor of education. Non-teaching assistantships in various studio areas also are available.

The program leading to the master of fine arts degree is designed to provide superior preparation in the visual arts or design and crafts for those whose aim is professional work in the field of art or for those who plan to teach at the college level.

The preferred degree for admission to the graduate program in visual art is the BFA degree. However, applicants holding the BA, BS and other bachelors degrees are strongly encouraged to apply. All applicants are required to meet the graduate school standard of a grade point average of 3.0 or better on the last 60 hours of undergraduate work. Before acceptance to this program, the applicant must submit transcripts from each college or school of art attended and examples of work to the graduate studies committee of the art department. The committee evaluates the materials and determines the applicant's preparation and ability to undertake work for an advanced degree.

Students required to take the TOEFL must achieve a total score of 530, and a score of 52 in Section 1 of the test.

The portfolio should consist primarily of work in the intended major area. In addition, applicants are encouraged to submit a smaller number of works from a secondary area. Students whose preparation in art is deficient, as decided by the graduate studies committee, are required to take additional work before proceeding with the graduate program. Upon acceptance, the student must report to the director of graduate studies for assignment of an adviser.

The MFA program, consisting of 60-70 credit hours includes a minimum of 54 hours in studio art. Of the 54 studio hours, a minimum of 30 hours are to be in the major area and 9 hours in a minor area. The course of study is rounded out with 13 hours of electives and 6 hours of non-studio course work—usually in art history and two one-credit courses, 410 Graduate Studio Seminar and 404 MFA Thesis Documentation. A minimum of 30 credit hours must be in courses at the 400 level. Candidates must complete a minimum of 18 hours in art history courses during the undergraduate and graduate years.

A minimum residence of two years is required for the degree. The degree will not be granted solely upon the completion of the prescribed number of credit hours and the residence requirement, but rather as the student attains a high level of creative achievement.

Each MFA candidate is reviewed by the full graduate faculty of the art department once each year, and if work toward the degree is deemed unsatisfactory the student is placed on probation and will be reviewed the following semester. Two consecutive unsatisfactory reviews will eliminate the student from the program. During the semester prior to graduation the student must receive clearance from his/her committee to mount the thesis exhibition, and so to graduate.

A two-part thesis is required and must include:

- An exhibition selected and installed by the student to display professional achievement.
- A photographic record of the thesis exhibition with a statement concerning the ideas and problems of the work displayed.

Each degree candidate takes a two-hour oral examination that focuses on the candidate's thesis and aspects of academic study related to the thesis.

COURSES

CERAMICS

230—Intermediate Ceramics (3). Continuation of 130 with emphasis on wheel throwing and the vessel format. Further exploration of glazing and firing techniques. Group and individual critiques, demonstrations, slide lectures and visiting artists. Expendable materials fee. Prerequisite: instructor's consent.

331—Advanced Ceramics (3). Continuation of 330. Includes advanced problems in firing, clay and glaze technology, forming and ornamentation. Payment of expendable materials expense is required. Prerequisite: 330, instructor's consent required and (if repeated) Chemistry 1. May be repeated to 12 hours maximum. f,w.

332—Ceramics Sculpture (3). Sculptural forms constructed of slabs, coils and wheel-thrown elements. Payment of expendable materials expense is required. Prerequisite: 331. May be repeated to 9 hours maximum. f,w.

430—Graduate Ceramics (3). Advanced study of ceramic technology and design concepts with emphasis on directed development of individual work. Payment of expendable materials expense is required. Prerequisite: 331. May be repeated to 12 hours maximum. f,w.

431—Graduate Ceramic Sculpture (3). Directed development of individual work. Payment of expendable materials expense is required. Prerequisite: 331. May be repeated to 12 hours maximum. f,w.

DESIGN

215—Color Theory (3). An investigation of various color systems and their application to art. Prerequisites: Art 20 or its equivalent, and sophomore standing. w.

221—Space, Form and Structure (3). Advanced study of three-dimensional form; basic structural systems and machine production emphasized. Prerequisite: 220. Expendable materials fee required. f.

222—Space, Light and Color (3). Advanced study of three-dimensional form with emphasis upon spatial effects of light and color. Prerequisite: 220. Expendable materials fee required. f

320—Advanced Spatial Design (3). Advanced study of three-dimensional design; practical application of spatial design. May repeat to 15 hours maximum. Prerequisites: 221 and 320. f,w.

420—Graduate Spatial Design (3). Comprehensive study of three-dimensional design; emphasis on creative expression based on original theoretical research. Prerequisites: 322 & graduate standing. May repeat to 15 hours maximum. f,w.

DRAWING

260—Intermediate Drawing (3). Continuation of 160. Emphasis in basic anatomical knowledge in drawing the human figure. Expendable materials fee required. Prerequisite: 160.

261—The Comic Strip I (3). Exploration of the drawn comic page as an expressive art medium, practical and technical aspects of comic art including newspaper panels and multi-page stories. Prerequisites: two semesters of drawing and/or instructor's consent. w.

265—Anatomical Drawing (3). Anatomical structure of human figure as it relates to art. Drawing from live model; emphasis on gross anatomy as defined by skeletal and muscular structure. Expendable materials fee required. Prerequisites: sophomore standing & two semesters of drawing.

273—Intermediate Color Drawing (3). Continuation of 173 with emphasis on design and organization. Prerequisite: 173.Expendable materials fee required.

360—Advanced Drawing (3). Continuation of 260, with increased emphasis on expressive drawing and composition. Repeatable to 15 hours. Expendable materials fee required. Prerequisite: 260. f,w,s.

361—The Comic Strip II (3). Advance work in comic art medium with emphasis on individual creative expression in content as well as technique. Prerequisites: 261 and instructor's consent. w.

365—Advanced Anatomical Drawing (3). Continuation of Art 265, Anatomical Drawing, with and emphasis on formal analysis of the figure in drawing based on superficial and deep anatomical structure. Prerequisites: Art 260 or 265 and graduate standing.

373—Advanced Color Drawing (3). Continuation of 273 with emphasis on the expressive properties of color in figural compositions. Prerequisites: 273 or instructor's consent. Repeatable to 15 hours. Expendable materials fee required

460—Graduate Drawing (3). Continuation of 360 with emphasis on individual creative expression. Prerequisites: 360 and graduate Art major. May repeat to 15 hours maximum. Expendable materials fee required. f,w,s.

461—The Comic Strip III (3). Continuation of 361 with added emphasis on professional methods and techniques. Prerequisites: 361 or instructor's consent. w.

473—Graduate Color Drawing (3). Continuation of 373 with emphasis on individual creative expression. Prerequisites: 373, instructor's consent or graduate standing. Repeatable to 15 hours. Expendable materials fee required

EXPERIMENTAL MEDIA

270—Experimental Media I (3). Ordering and structuring materials into compositional forms, using various media, traditional as well as new. Subject matter will vary each semester. Prerequisites: 160 and 220 or instructor's consent. f,w.

370—Experimental Media II (3). Continuation of 270. Prerequisite: 270. f,w.

371—Experimental Media III (3). Continuation of 370. Prerequisite: 370. May repeat to 9 hours maximum. f,w.

470—Experimental Media IV (3). Advanced study of compositional organization at the graduate level. Prerequisites: 371 & graduate standing. May repeat to 9 hours maximum. f,w.

FIBERS

240—Intermediate Fibers (3). Continuation of 140 with emphasis on utilizing acquired technical processes in loom and off weaving, paper making and surface design and a means of developing visual statements. Expendable materi-

als fee required. Prerequisite: 140.

340—Advanced Fibers (3). Exploration of aesthetic concepts, development of personal style and instruction in advanced fiber techniques within medium selected by student. Expendable materials fee required. Prerequisites: 240 or approved equivalents. May repeat to 15 hours maximum. f,w.

440—Graduate Fibers (3). Advanced technical and aesthetic study in medium of choice with emphasis on development of the individual student's ideas and goals. Expendable materials fee required. Prerequisites: 340 and graduate standing. May repeat to 15 hours maximum.

GENERAL

205—International Summer Study Abroad (3). 4 week summer session. Students will produce original art work, keep a written journal, and participate in a variety of activities. Prerequisites: Art 5 or 2, 60 and instructor's consent, Studio Art Class Abroad.

280—Undergraduate Internship in Art (1-3). Special learning situations not covered by coursework. Credit standards pre-arranged with dept. Prerequisites: junior standing & departmental consent. Open only to Art & Art Education majors. Limit on total hours of problems courses applies.

305—International Summer Study Abroad (3). Four-week summer session. Advanced study in chosen medium. Emphasis on individual creative expression. Prerequisites: graduate standing or instructor's consent of the Studio Art Class Abroad.

410—Graduate Studio Seminar (1). Practical and philosophical concerns of the visual artist. Man- dated for all MFA candidates. Prerequisites: graduate standing.

GRAPHIC DESIGN

210—Introduction to Calligraphy (3). Technical and historical instruction on five calligraphic alphabets. Application of hand lettering to both two and three-dimensional design projects. Emphasis placed on both technical mastery of letters and creative expression in projects. Prerequisite: 20, 60 or instructor's consent. f,w,s.

225—Graphic Design I (3). Emphasis on developing a design language and vocabulary. Projects explore visual images in two-dimensional space, each one focusing on a specific set of relationships. Introduction to methodological and research practices for designers. Payment of expendable materials fee is required. Prerequisite: 20, 60 f,w.

226—Graphic Design II (3). Introduction to the discipline, function and tradition of typography. Topics include evolution and anatomy of typography, communication, legibility/readability, language sequence and information hierachy. Introduction to graphic design software. Payment of expendable materials fee is required. Prerequisite: 225. f,w.

310—Advanced Calligraphy (3). Technical and historical instruction to calligraphic alphabets including Uncial, Fraktur, Copperplate and Neuland. Application of hand lettering in two and three-dimensional design projects. Emphasis placed on both mastery of letters and creative exploration in projects. Prerequisite: 210. f,w,s.

325—Graphic Design III (3). Further exploration of typographic form and manipulation of variables which affect content. Course includes letterform analysis and drawing, composition and book design with emphasis placed on research and independent study. Payment of expendable materials fee is required. Prerequisite: 226. f,w.

326—Graphic Illustration I (3). Exploration of editorial illustration from initial conception through layout design incorporating type. Practical and technical aspects of illustration, including black and white "line art", and "full-color" reproduction processes. Prerequisites: Graphic Design II and Drawing III

327—Graphic Design IV (3). Goal directed graphic design problem solving stressing the integration of theory and practical applications while sharpening conceptual, computer, and research skills. Topics include historical research, current design theory and advanced typographic study. Preparation of comprehensive portfolio and consideration of professional requirements. encountered by the designer. Payment of expendable materials fee is required. Prerequisite: 325. f,w

425—Graphic Design V (1-5). Directed research, study and critical analysis in graphic design. Complex projects including grid systems, design theory, history, symbolic systems, communication, methodologies and typographic form. Emphasis placed on research, writing, problem solving, aesthetic perception, conceptual thinking skills and technical proficiency. Payment of expendable materials fee is required. Prerequisite: graduate standing. f,w.

METALS

250—Beginning Metals (3). Comprehensive introduction to basic techniques in jewelry and silversmithing with emphasis on design. Techniques include sawing, soldering, piercing, bezel setting, forging, reticulation and etching. Payment of expendable materials expense is required. Prerequisites: 20, 220 and instructor's consent. f,w.

350—Basic Casting (3). Lost wax method of centrifugal casting, including vacuum, steam and cuttlefish casting. Payment of expendable materials expense is required. Prerequisites: 250 & instructor's consent. f,w.

351—Enameling (3). Techniques of applying enamels to nonferrous metals. Payment of expendable materials expense is required. Prerequisites: 250, 350 and instructor's consent. f.

352—Raising (3). Design and construction of hollow and flatware forms. Techniques include forming by planishing, sinking, upsetting and raising, and methods of finishing and ornamentation. Payment of expendable materials expense is required. Prerequi- sites: 350, 250 & instructor's consent. w.

353—Advanced Techniques in Metals (3). Emphasis on complex design problems in jewelry and silversmithing, including chasing and repousse, wood graining and advanced stone-setting. Payment of expendable materials expense is required. Prerequisites: 350, 351, 352 and instructor's consent. May repeat to 9 hours maximum. f,w.

450—Graduate Seminar in Metals (3). Supervised research in individually directed projects in advanced jewelry design and construction; includes lapidary work. Payment of expendable materials expense is required. Prerequisites: 353, graduate Art major & instructor's consent. May repeated to 15 hours maximum. f,w.

PAINTING

277—Intermediate Painting (3). Continuation of 177 with the addition of portrait painting. Prerequisite: 177. Expendable materials fee required. f,w,s.

377—Advanced Painting (3). Advanced problems in oil and acrylic painting. Prerequisite: 277. May be repeated to 15 hours maximum. Expendable materials fee required. f,w,s.

477—Graduate Painting (3). Advanced study continued. Emphasis on individual creative expression. Prerequisite: 377 and graduate Art major. May repeat to 15 hours maximum. Expendable materials fee required. f,w,s.

PHOTOGRAPHY

235—Beginning Photography (3). Basic photography as an art form; camera and darkroom techniques; surveys photographic history and esthetics. Camera with adjustable aperture and shutter required. Payment of expendable materials expense is required. Prerequisite: 8 hours Studio Art and instructor's consent required. f,w.

236—Photography: Field Sessions (1-3). On location, hands on experience in photography of landscape specific subjects. Unless otherwise indicated, all camera formats and black-white, color slide, or color print film are appropriate. Consult course/workshop announcements for specifics regarding locations, lodging arrangements, materials, whether or not a darkroom will be available and follow-up critiques. Required prerequisites will be indicated for each workshop.

335—Intermediate Photography (3). Continuation of 235 with emphasis utilizing acquired technical process to facilitate use of the camera as a means of developing awareness of immediate environment and the capabilities of Photgraphy as a communicative, documentary, and expressive medium. Payment of expendable material fee is required. Prerequisite: 235 or approved equivalent and consent required. f,w.

336—Advanced Photography (3). Exploration of aesthetic concepts, development of personal vision, and instruction in advanced technical process including fine B&W printing, negative and positive color, large format, zone system, and portfolios and book design to facilitate critical observation and personal expression through the medium of Photography. Payment of expendable materials fee is required. Prerequisites: 235 and 335 or approved equivalents, and consent required. May repeat to 15 hours maximum. f,w.

435—Graduate Photography (3). Advanced technical study with emphasis on development of the individual student's creative ideas. Payment of expendable materials expense is required. Prerequisites: 335 & graduate standing and consent required. May repeat to 15 hours maximum. f,w.

PRINTMAKING

291—Intaglio Printmaking (3). Intaglio printing techniques, including etching, engraving and aquatint. Prerequisites: 20 and two semesters of drawing. May repeat to six hours maximum. Expendable materials fee required. f,w.

292—Lithography (3). Lithographic printing techniques from stone and metal plates. Prerequisite: 20 and two semesters of drawing. Expendable materials fee required. f,w.

390—Advanced Printmaking (3). Advanced study in relief, intaglio or lithographic printmaking with emphasis on individual creative expression. Prerequisites: 290 or 291 or 292 consent required. May repeat to 15 hours maximum. Expendable materials fee required. f,w

490—Graduate Printmaking (3). Graduate level study in relief, intaglio or lithographic printmaking with emphasis on individual creative expression. Prerequisites: 390 and graduate standing. May repeat to 15 hours maximum. Expendable materials fee required. f,w.

PROBLEMS

300—Problems in Art (1-3). Directed advanced study and practice of art in a combination of areas related to, but not included in, scheduled courses. Prerequisites: senior standing or adequate preparation in Art and instructor's consent. f,w,s.

301—Topics (4). Special studies in studio art; covers subjects not included in regularly offered courses. Prerequisites: junior standing and instructor's consent. f,w,s.

302—Senior Seminar (3). A capstone course for the undergraduate art degree with emphasis on the production of a written statement relating to the students' visual research. Prerequisite: senior standing. f. (WI)

402—Graduate Collaboration (1-4). Collaborative projects involving two or more students in Department of Art. f,w.

404—MFA Thesis Exhibition Documentation (1). Preparation of materials deemed necessary to document in a permanent form the thesis exhibition. Credit will be granted upon the satisfactory completion of the document, which will be retained by the Department of Art. Required of all MFA candidates.

410—Graduate Studio Seminar (1). Practical and philosophical concerns of the visual artist. Man- dated for all MFA candidates. Prerequisites: graduate standing.

424—Problems in Design (1-12). Graduate level work in graphic design. Prerequisite: 425, and departmental con-

sent.

429—Problems in Photography (1-12). Supervised research in creative photography. Prerequisite: 425 and graduate standing. f,w.

434—Problems in Ceramics (1-12). Graduate level work in ceramics. Prerequisites: 430 or 431 and departmental consent.

444—Problems in Fibers (1-12). Graduate level work in fibers. Prerequisites: 440 and departmental consent.

454—Problems in Metals (1-12). Prerequisites: 15 hours of 450 and instructor's consent. May be repeated to 12 hours maximum. f,w.

456—Historic Research in Artcrafts (1-4). Prerequisite: departmental consent. f,w.

464—Problems in Drawing (1-12). Prerequisites: 460 and departmental consent. f,w.

474—Problems in Experimental Media (1-12). Independent study at the graduate level. May be repeated to a maximum of 12 hours. Prerequisites: 470 & graduate standing. f,w.

479—Problems in Painting (1-12). Prerequisites: 477 and departmental consent. f,w.

489—Problems in Sculpture (1-12). Prerequisites: 485 and departmental consent. f,w.

494—Problems in Printmaking (1-12). Prerequisites: 490 and departmental consent. f,w.

499—Problems in Serigraphy (1-12). Prerequisites: 496 and instructor's consent. f,w.

SCULPTURE

285—Intermediate Sculpture (3). Continuation of 285. Introduction to carving techniques. Payment of expendable materials expense is required. Prerequisite: 185. f,w.

385—Advanced Sculpture (3). This course will build skills aquired in Art 285, Intermediate Sculpture including welding, casting, carving and assemblage with emphasis on the development of a personal visual language. Prerequisite: 285, may repeat to 15 hours maximum. f,w.

387—Sculpture in Plastics (3). Explores polyester, epoxy and acrylic plastics as sculptural media. Payment of expendable materials expense is required. Prerequisite: 385. May repeat to 6 hours maximum. f,w.

388—Sculptural Welding and Metal Casting (3). Payment of expendable materials expense is required. Prerequisite: 385. May repeat to 6 hours maximum. f,w.

485—Advanced Sculptural Composition (3). Payment of expendable materials expense is required. Prerequisite: 385 and grduate standing. may repeat to 15 hours maximum. f,w.

SERIGRAPHY

296—Serigraphy I (3). Introduces methods, materials, and techniques of printmaking with the silk screen. Payment of expendable materials expense is required. Prerequisites: 20 & one semester of Drawing. f,w.

396—Serigraphy II (3). Advanced study of serigraphy: pictorial composition through stencil arrangements emphasized. Payment of expendable materials expense is required. Prerequisite: 296. May repeat to 15 hours maximum. f,w.

496—Graduate Serigraphy (3). Advanced problems in serigraphy with emphasis on creative expression through a combination of methods. Payment of expendable materials expense is required. Prerequisites: 396 & and graduate Art major. May repeat to 15 hours maximum. f,w.

WATERCOLOR

275—Intermediate Water Color (3). Continuation of 175, Beginning Watercolor, theory and practice of painting in watecolor. Expendable materials fee required. Prerequisite: 175.

375—Advanced Water Color (3). Advanced problems in water color. Prerequisite: 275. May repeat to 15 hours maximum. Expendable materials fee required. f,w.

475—Graduate Water Color (3). Advanced study in water color. Emphasis on individual creative expression. Prerequisites: 375 and graduate standing. May repeat to 15 hours maximum. Expendable materials fee required. f,w.

Art History and Archaeology

College of Arts and Science
109 Pickard Hall (573) 882-6711

FACULTY

Howard Wight Marshall, chair, professor, PhD, Indiana University. American folk art, material culture, and vernacular architecture.

Patricia Crown, director of graduate studies, professor, PhD, University of California-Los Angeles. 18th- and 19th-century art.

William Biers, professor, PhD, University of Pennsylvania. Greek art and archaeology.

Norman Land, professor, PhD, University of Virginia. Italian Renaissance art and Baroque art.

Osmund Overby, professor emeritus, PhD, Yale University. Architecture and American art.

Kathleen Warner Slane, professor, PhD, Bryn Mawr College. Roman art and archaeology.

Homer Thomas, professor emeritus, PhD, University of Edinburgh.

John Klein, associate professor, PhD, Columbia University. Modern art.

Marcus Rautman, associate professor, PhD, Indiana University. Late antique, Byzantine, and early Medieval art and archaeology.

Anne Rudloff Stanton, assistant professor, PhD, University of Texas-Austin. Late Medieval and northern Renaissance art.

DEGREES: MA and PhD in art history and archaeology

The Department of Art History and Archaeology offers the MA and the PhD degrees in art history and archaeology. The department also supports interdisciplinary graduate minors in historic preservation and in museum studies for students enrolled in this or other departments.

Applicants in both art history and archaeology are eligible for University fellowships awarded to entering students through a campus-wide competition. More advanced students may be awarded the departmental Herbert Schooling Scholarship or the John Pickard Fellowship. Those in classical archaeology are eligible for the Walter Miller Fellowship. Holders of these fellowships may, with proper consent, hold additional grants not to exceed $1,000 or may hold teaching assistantships. The Weinberg Traveling Fellowship in classical archaeology also is available for advanced students. Several quarter-time teaching assistantships (10 hours a week) are available. Resident and nonresident educational fee waivers may be available to holders of fellowships and assistantships. These have application deadlines of February 1.

For more information, write the director of graduate studies in Art History and Archaeology, 109 Pickard Hall, Columbia, MO 65211.

ADMISSION

Of the limited number of persons admitted annually to the graduate programs, preference is given to candidates for the PhD degree. Applicants must have a recognized bachelor's degree in art history or art, in archaeology or classical languages, or in a related field of the humanities. Applications accompanied by a transcript, official GRE general test scores, three letters of recommendation, a short statement of professional goals, and a recent term paper should be submitted before February 1 for the following fall semester.

MASTER'S DEGREE: The department considers the MA a broad training program and therefore stresses the diversification of courses. This degree qualifies the graduate for some work in museums, in historic preservation and in slide libraries, and is a prerequisite for doctoral study.

The minimum 30 credit hours must include 15 hours of 400-level courses, with no more than nine hours of readings or special problems. Course 401 is required of all students in their first year of graduate study. The program should include at least one 300-level course from each of three periods (Ancient, Medieval/Renaissance and Modern) and two seminars. Courses for an interdisciplinary minor may not be counted within the 30 hours required for the MA.

Since an ability to work with different language resources is essential to art historical research, the department asks all students to demonstrate a proficiency in reading two foreign languages: German, and French or Italian. This requirement may be satisfied either by a departmental reading examination, which is offered around mid-semester, or by the Graduate School Foreign Language Test given by the Testing Services office. Students are encouraged to take an appropriate language course (e.g., 207) in preparation for these exams. All students should complete the first language during the first year of study and the second language during the second year of study. Classical archaeology students are expected further to demonstrate a reading knowledge of either Greek or Latin by completing a 300-level course with a grade of B or better. With faculty approval, students in the Historic Preservation program may substitute a group of field research techniques for one language. The language requirement must be completed before the student is granted an interview for candidacy (see below).

Before being admitted as candidates for a degree, all students in art history and archaeology must demonstrate in a written examination their familiarity with key monuments of art appropriate to their field of study. Separate examinations are given in two fields of study: archaeology and art history. Students are expected to identify 30 monuments (artist; name of monument, including location for architectural sculpture and other immovables; date; and where pertinent, country) and to discuss briefly their significance. The examination is given once each semester, usually in the sixth week. Each student should secure from the director of graduate studies specific instructions for this test and plan to remedy deficiencies. Students are expected to take the examination during the first semester in residence, and it must be passed by the third semester in residence.

A thesis is required. Admission to candidacy

for the master's degree is granted after a formal interview discussing the thesis proposal. Application for an interview for candidacy may be made only after a student:

- fulfills the language requirements,
- passes the qualifying examination. and
- selects a specific field and adviser for the master's thesis.

Only after being admitted to candidacy may students take 490 Research.

The student must submit a draft of the thesis to the adviser at least two months before the final draft is due. The final oral examination includes defense of the thesis and general questions in related fields.

DOCTORAL DEGREE: Although an MA is a prerequisite for the PhD in both classical archaeology and art history, students should indicate their interest in pursuing a doctorate in the initial application. Students having MA degrees from other institutions must pass the department's qualifying examination in the first semester in residence, and the department may require a thesis from a student who did not write one for an MA degree. The language requirement for the PhD degree is the same as for the MA, plus a reading knowledge of any other language necessary for preparation of the dissertation. Students in classical archaeology will complete a second ancient language.

A total of 42 hours beyond the MA (48 hours for students who have an MA degree from another university) is required, of which at least 32 must be taken within the department. In addition, 401 will be required unless the student has previously taken a course considered equivalent. At least 18 hours of seminars are required (besides 401 and the six hours taken for the MA degree), of which at least six must be outside the major area in art history or archaeology. Each student also must take at least nine hours of lecture courses outside the major area. The doctoral program committee should be appointed during the first term in residence to approve transcripts of previous credit, to accept the MA thesis, and to plan a program of study. 470, 471, 472 and 480 may be counted toward the seminar requirement only with the approval of the student's committee.

A formal interview is required for admission to PhD candidacy and is granted only upon fulfillment of language and qualifying examination requirements. Each student arranges a program of courses in close consultation with an adviser and with the approval of a doctoral program committee.

The comprehensive examination in the major and minor areas of art history and archaeology, predetermined by the student and the doctoral program committee, consists of both written and oral examinations.

The dissertation is expected to be an original contribution to scholarship in the field. The final examination, an oral defense of the dissertation, tests the candidate's knowledge of the special field.

Further guidelines, including available areas of doctoral study, are included in the department's graduate programs brochure.

COURSES

201—Topics in Art History and Archaeology (1-3). Selected studies in various facets of art history and archaeology. Prerequisite: departmental consent.

219—NE Eastern and Egyptian Art and Archaeology (3). Development of art and architecture of the Near East and Egypt in the Bronze Age. alt. f.

220—Greek Art and Archaeology (3). General survey of development of material culture in Greece from earliest time to Hellenistic period. Recommended pre- requisite: 10, or General Honors 101 or History 102 or instructor's consent. f.

221—Roman Art and Archaeology (3). General survey of development of material culture in Roman world from earliest time through the 3rd century. Recommended prerequisite: 10 or General Honors 101, or History 102 or instructor's consent. w.

222—Ancient Technology (3). Engineering, architecture, and military technology in the ancient world. Prerequisite: sophomore standing. alt. w.

239—Early Christian and Byzantine Art (3). General survey of the visual arts of Byzantium and her neighbors from the founding of Constantinople in A.D. 330 to the Ottoman conquest of 1453. f.

240—Early Medieval Art (3). Architecture, painting and sculpture of Europe from 4th century to beginning of Romanesque period. Recommended pre- requisite: 10, General Honors 102 or instructor's consent.

241—Late Medieval Art (3). Art and architecture in Europe from Charlemagne through the 14th century. Recommended prerequisite: 10, General Honors 102 or instructor's consent.

250—Italian Renaissance Art (3). Architecture, painting and sculpture of Italy from 14th through 16th century. Recommended prerequisites: 11, General Honors 103, or instructor's consent. f.

251—Northern Renaissance Art (3). Art and architecture in Northern Europe from the 14th through the 16th century. Recommended prerequisites: 11, General Honors 103, or instructor's consent. f, alt yrs.

260—Baroque Art (3). European architecture, painting and sculpture of the 17th century. Recommended prerequisites: 11, General Honors 103 or instructor's consent. w.

261—Eighteenth Century European Art (3). 18th-century European painting, sculpture and architecture. Recommended prerequisites: 11, General Honors 103 or instructor's consent. f.

264—Traditional Architecture (3). Traditional/vernacular building from the 18th centruy to the present, with emphasis on the British Isles and America. Prerequisites: 11, 141 History 20, 103 or instructor's consent.

270—Nineteenth Century European Art (3). 19th-century European painting, sculpture and architecture. Recommended prerequisites: 11, General Honors 104 or instructor's consent. w.

271—Modern Art in Europe and America (3). International directions in painting, sculpture, and architecture from 1885 to ca. 1940. Recommended prerequisites: 11, 141, General Honors 104 or instructor's consent. f.

272—Contemporary Art (3). Painting, sculpture, and architecture from the Second World War to the present. Prerequisite: 11, 141, General Honors 104, or instructor's consent.

282—Museum Internship (3). A one-semester or full summer intensive internship for departmental majors with specific projects and responsibilities to be arranged by the student in cooperation with a faculty member and an approapriate agent of the museum involved. May be taken as an elective only. May be repeated for a maximum of 6 hours credit. Prerequisite: instructor's consent.

290—Honors Proseminar I (3). Introduction in research, individual reports, papers. Prerequisite: junior standing. Restricted to Honors candidates.

291—Honors Proseminar II (3). Continuance of 290. w.

292—Honors Reading and Research I (3). Individual research projects in preparation of senior thesis. Prerequisite: senior standing. Restricted to Honors candidates.

293—Honors Reading and Research II (3). Preparation of senior thesis. Prerequisite: 292. w.

300—Problems (1-99). Special studies in art history/archaeology; covers subjects not included in regularly offered courses. Prerequisites: adequate preparation in Art History, Archaeology, Anthropology, Classical Languages, or History; and instructor's consent.

301—Topics in Art History and Archaeology (1-99). Special studies in art history/archaeology; covers subjects not included in regularly offered courses. Prerequisites: adequate preparation in Art History and Archaeology, Anthropology, Classical Languages, or History; and instructor's consent.

308—Greek Vase Painting (3). Examination of vase painting with an emphasis on iconography and artistic style of selected painters. Prerequisites: 220 or instructor's consent.

309—Ancient Monumental Painting (3). Survey of art of painting and mosaics in Greek and Roman antiquity. Prereq-uisites: 220, 221 or instructor's consent.

310—Greek Sculpture (3). Survey of sculptor's art in Aegean and Classical world from earliest times to Hellenistic period. Prerequisites: 220 or instructor's consent.

311—Roman Sculpture (3). The origins and development of sculpture in the Roman Republic and the Roman Empire. Prerequisites: 221 or instructor's consent.

312—Greek Architecture (3). Survey of the art of building in the Aegean and Classical world from earliest times to the Hellenistic period. Prerequisite: 220 or instructor's consent.

313—Roman Architecture (3). The history of Roman architecture, origin and development of forms and techniques, major monuments in Rome and its provinces through the 3rd century after Christ. Prerequisites: 221, General Honors 101, or instructor's consent.

314—Archaeological Methods (2-6). Methods of excavating various types of sites; recording, preserving their materials. Prerequisites: adequate preparation in archaeology or anthropology and instructor's consent.

315—Minor Arts of Antiquity (3). Discussion of selected minor arts and crafts of the Greco-Roman world. Prerequisite: instructor's consent.

317—Archaeology of the Greek Bronze Age (3). Analysis of the material culture of Greek prehistoric civilizations from 3000 to 1000 B.C.. Prerequisites: 220 or instructor's consent.

323—Greek and Roman Numismatics (3). Coinage of Greek city-states and/or Roman Republic and Empire. Prerequisites: Greek 3 or Latin 3 depending on the emphasis.

330—Late Antique Art and Archaeology (3). Exploration of the material culture of the Mediterranean world from the 3rd century to Iconoclasm. Prerequisites: 221, 239 or instructor's consent.

336—Art of the Dark Ages (3). Survey of the visual arts of western Europe during the period of migrations, from the fall of Rome to the Carolingian renovation of the 9th century. Prerequisites:240 or equivalent or instructor's consent.

341—Byzantine Art and Archaeology (3). Historical investigation of Byzantine material culture in the eastern Mediterranean and Russia, from the outbreak of Iconoclasm to the ottoman conquest. Prerequisites: 239 or equivalent or instructor's consent.

342—Romanesque Art and Architecture (3). Discussion of selected topics in architecture, sculpture and painting and their artistic and cultural relationship from ca. 800 to ca. 1150. Prerequisites: 241 or equivalent, or instructor's consent.

343—Gothic Art and Architecture (3). Discussion of selected topics in architecture, sculpture and painting and their artistic and cultural relationship from ca. 1150 to ca. 1400. Prerequisite: 241 or equivalent, or instructor's consent.

350—Michelangelo and the High Renaissance (3). Sculpture, architecture, paintings, and drawing of Michelangelo in

the context of his times. Prerequisite: 250 or equivalent.

351—Renaissance and Baroque Architecture (3). Problems in European architectural history from 14th through 17th century. Prerequisites: 250, 260 or equivalent.

352—Renaissance Figural Arts of Northern Europe (3). Discussion of selected topics in painting and sculpture and their artistic and cultural relationships from the fourteenth through the sixteenth century in northern Europe. Prerequisites: 241, 251 or equivalent, or instructor's consent.

353—Venetian Painting (3). Survey of Venetian Painting from the 14th through the 18th century. Prerequisites: 11, 250 or 260.

354—The Renaissance Artist (3). Lectures, readings, discussions and a research paper related to the Renaissance artist. Focus will be on representations of the artist in art and literature from ca. 1300 to ca. 1650. Prerequisite: 250, 260.

359—Baroque Figural Arts (3). Painting and sculpture of Italy in 17th century. Prerequisite: 260, 261, or equivalent.

360—British Art 1640-1840 (3). Prerequisite: 261 or instructor's consent.

361—Rococo to Romanticism (3). Rococo through romanticism: styles and issues in 18th century art. Prerequisite: 261 or equivalent.

363—Women, Art and Society 1700-1920 (3). (same as Women Studies 363). This course surveys and analyzes the careers and works of selected European and American women artists, and images of women (by female and male artist) in the 18th, 19th and the first half of the 20th centuries. Prerequisites: junior standing, Art History 11 or equivalent, and instructor's consent.

364—Material Folk Culture (3). An exploration of traditional European-American and American material culture (art, craft, architecture) from a multidisciplinary perspective. Special attention is given to the relationship of the natural to the man-made environment. Prerequisite: 142 or equivalent.

365—American Architecture (3). Architecture from colonial period to present in relation to European architecture. Prerequisite: 141 or equivalent.

366—Modern Architecture (3). Problems in the history of architecture from late 18th century to the present. Prerequisites: 141, 270, 271 or equivalent.

371—Modern Sculpture (3). Sculpture in Europe and the U.S. ca. 1880 to the present, with special emphasis on changing definitions of the medium. Prerequisite: 271, 272, or instructor's consent.

372—Advanced Course in Contemporary Art (3). Topics in European and American painting and sculpture after 1950. Prerequisite: 271 or 272 and instructor's consent.

374—Historic Preservation Methods (1-6). Research techniques to solve research problems and conduct field recording in historic preservation, material culture, historic architecture, and cultural heritage studies. Prerequisites: 364, 375 or instructor's consent. Repeatable to a maximum of 9 hours. f.

375—Historic Preservation (3-9). (same as History 375).

376—Topics in Museum Studies (3). Lectures and reports on selected topics including connoisseurship of archaeological and art objects, the history of collecting, and curatorial topics. Prerequisites: graduate standing or instructor's consent.

401—Introduction to Graduate Study (3). Methods of research, bibliography, use and criticism of source material. Required of graduate students in art history and archaeology who have not had 290. Prerequisite: graduate standing. f.

402—Historiography of Art and Archaeology (3). Literature of art and archaeology in terms of works of leading European art historians, archaeologists. Required of graduate students in art history and archaeology. Prerequisite: graduate standing. w.

404—Art Theory and Criticism (3). Theoretical and critical literature of art from earliest times to the present. Prerequisite: graduate standing.

410—Seminar in Greek Art and Archaeology (1-99). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisites: 308, 310, 312 or equivalent.

411—Seminar in Roman Art and Archaeology (1-99). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisites: 309, 311, 313, or equivalent.

414—Ancient/Medieval Topography (1-99). Descriptive and historical analysis of a selected city or site. Subject varies. Prerequisite: instructor's consent.

420—Seminar in Medieval Art and Archaeology (1-99). Specific subjects of study will be assigned to students for presentation in relation to broader questions of the cultural/historical phenomena of the time, from ca 700 to ca 1400. Prerequisites: 341, 342 or 343 or equivalent.

430—Seminar in Renaissance Art (3). Special subjects of study assigned for Northern or Southern Renaissance for individual research, discussion of reports by seminar members. Prerequisites: 350 or 352 or equivalent.

431—Seminar in Northern Renaissance Art (1-9). Selected subjects on painting or sculpture are assigned to students for presentation and will be discussed in broader context of the cultural/historical phenomena of the time. Prerequisite: 352 or equivalent.

449—Seminar in 18th Century Art (1-99). Special subjects of study in 18th century art assigned for individual research; reports to be presented and discussed by seminar members. Prerequisite: AHA 261, 361 or instructor's consent.

450—Seminar in 19th Century Art (1-99). Special sujects of study in 19th century art assigned for individual research; reports to be presented and discussed by seminar members. Prerequisite: AHA 270 or instructor's consent.

451—Seminar in Modern and Contemporary Art (1-99). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisites: 271, 272 or equivalent.

452—Seminar in Modern Architecture (1-99). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisite: 271 or equivalent.

454—Nineteenth Century Painting (3). Graduate lecture course. Special attention will be given to Victorian painting, landscape, the development of abstraction and the concept of realism. Prerequisite: graduate standing.

460—Seminar in American Art (1-99). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisite: 365 or equivalent.

465—Internship in Historic Preservation (3-6). An internship in a relevant organization or historic preservation agency to be arranged by the student and the program director. Prerequisite: instructor's consent.

470—Museum Studies I: History, Philosophy, Functions & Future Museums (3). Functions and history of museums and interrelations among departments, including those of director, curator, registrar, education, conservation, and marketing. Topics include acquisitions policies; public outreach; role of architecture; and philosophical and legal issues pertaining to administration of muesums. Prerequisites: graduate standing and instructor's consent.

471—Museum Studies II: Collections, Management, Care & Preservation (3). Appropriate means for care and display of artifacts. Topics include: accessioning, cataloging, retrieval of information, and laws and ethics of collecting; the museum environment and its monitoring; condition reports, shipping and storage, and conservation. Field trips. Prerequisite: 470 or instructor's consent.

472—Museum Curatorship: Exhibition Design and Preparation (1-6). A comprehensive study of exhibitions, focusing on their relevance and quality, and on research, design, interpretation and use. The organization of an exhibition from conception to opening reception and complementary programming. Students will select art work for an exhibition. Prerequisites: 470.

475—Principles of Conservation (3). Introduction to and analysis of the theory and application of conservation, preservation, and restoration of artifacts: Prerequisite: 470.

476—Museum Internship (3). A one semester of full summer intensive internship with specific projects and responsibilities to be arranged by the student and the program director. Prerequisite: 470,471 and instructor's consent.

480—Readings (1-99). Reading, critical evaluation of literature of special fields of art history and/or archaeology. Prerequisite: 401 or equivalent.

490—Research and Thesis (1-99). Individual research leading to preparation of thesis or dissertation. Prerequisite: Admission to candidacy. Graded on a S/U basis only.

Biochemistry

College of Agriculture, Food and Natural Resources
School of Medicine
117 Schweitzer Hall (573) 882-4845

FACULTY

William R. Folk, chair, professor, PhD, Stanford University.

Warren L. Zahler, associate chair, director of undergraduate studies, associate professor, PhD, University of Wisconsin.

Peter A. Tipton, director of graduate studies, associate professor, PhD, University of Wisconsin.

Dennis Lubahn, director of graduate admissions, associate professor, PhD, Duke University.

Benedict J. Campbell, director of medical education studies, professor emeritus, PhD, Northwestern University.

David W. Emerich, professor, PhD, University of Wisconsin.

George B. Garner, professor emeritus, PhD, University of Missouri.

Charles W. Gehrke, professor emeritus, PhD, The Ohio State University.

Thomas Guilfoyle, professor, PhD, University of Illinois.

Richard E. Hillman, professor, MD, PhD, Yale University.

Roy O. Morris, professor, PhD, University College, London.

Ezio A. Moscatelli, professor emeritus, PhD, University of Illinois.

Boyd L. O'Dell, professor emeritus, PhD, University of Missouri.

Beryl J. Ortwerth, professor, PhD, University of Missouri.

Joseph C. Polacco, professor, PhD, Duke University.

Edward E. Pickett, professor emeritus, PhD, The Ohio State University.

Douglas D. Randall, professor, director of Interdisciplinary Program in Plant Biochemistry and Physiology, PhD, Michigan State University.

R. Michael Roberts, professor, DPhil, Oxford University, England.

Frank J. Schmidt, professor, PhD, University of Wisconsin.

Grace Sun, professor, PhD, Oregon State University.

Roger Sunde, professor, leader of Nutrition Cluster, PhD, University of Wisconsin.

Wynn A. Volkert, professor, PhD, University of Missouri.

Judy D. Wall, professor, PhD, Duke University.

Gary Weisman, professor, PhD, University of Nebraska.

Robert L. Wixom, professor emeritus, PhD, University of Illinois.

Derek Cash, associate professor, PhD, Duke University.
David Eide, associate professor, PhD, University of Wisconsin-Madison.
Jeanne Erickson, research associate professor, PhD, University of Michigan.
Kent Gates, associate professor, PhD, Northwestern University.
Klaus Gerhardt, research associate professor, Dr. rer. nat, Technical University of Berlin.
Gretchen Hagen, research associate professor, PhD, University of Georgia.
Mark Hannink, associate professor, PhD, University of California-San Diego.
Michael Henzl, associate professor, PhD, University of Wisconsin.
Ingming Jeng, associate professor, PhD, University of California-Berkeley.
Dennis Lubahn, associate professor, PhD, Duke University.
Ruth MacDonald, associate professor, PhD, University of Minnesota.
Thomas P. Mawhinney, associate professor, director of Agricultural Experiment Station Laboratories, PhD, Albany Medical College.
Bruce A. McClure, associate professor, PhD, University of Minnesota.
Virginia E. Peterson, resident instruction associate professor, PhD, University of Maryland.
Thomas P. Quinn, associate professor, PhD, St. Louis University.
Lesa Beamer, assistant professor, PhD, Johns Hopkins University.
David T. Chin, research assistant professor, director of the Protein Sequencing and Chemistry Facility, PhD, University of Utah.
Creighton Cornell, assistant professor emeritus, DVM, University of Missouri-Columbia.
Susan L. Deutscher, assistant professor, PhD, St. Louis Medical School.
Laurie Erb, research assistant professor, PhD, University of Missouri.
Joe Forrester, research assistant professor, PhD, University of Missouri.
Laura Green, research assistant professor, PhD, Stanford University.
Andrey Komissarov, research assistant professor, PhD, Moscow State University.
Mark E. Martin, assistant professor, PhD, University of Mississippi Medical Center.
Charlotte Phillips, assistant professor, PhD, North Carolina State University.
Michael Riley, research assistant professor, PhD, University of Kansas.
Krishna Sharma, assistant professor, PhD, University of Mysore, India.
Jack Tanner, assistant professor, PhD, Brown University.
Steve Van Doren, assistant professor, PhD, University of Illinois.
Ching Wang, assistant professor, PhD, Northwestern University.

DEGREES: MS and PhD in biochemistry

COOPERATIVE DEGREES: MS/MD and PhD/MD in biochemistry

INTERDISCIPLINARY AREA PROGRAM: PhD in nutrition area program and PhD in genetics area program

The graduate programs of the Department of Biochemistry prepare students for professional careers in academic institutions, industry and government. The Department of Biochemistry is administered by both the College of Agriculture, Food and Natural Resources and the School of Medicine. It provides a great range of opportunities for multidisciplinary study in plant, animal and microbial biochemistry and molecular biology. Virtually every important area of biochemistry and molecular biology is represented by the research interests of the faculty. These interests focus upon plant biochemistry, hormonal control of plant and animal-cell metabolism, growth-factor structure and function, enzyme reaction mechanisms, biochemistry of development, biochemistry of human disease, lipid and carbohydrate metabolism, molecular biology, analytical biochemistry and structural biochemistry.

The department has modern, well-equipped laboratories in Schweitzer Hall, Schlundt Annex and the Medical Sciences Building. Additional faculty are housed in the Animal Sciences Research Center, Dalton Cardiovascular Research Center, Chemistry Building and at Truman Veterans Hospital.

All students participate in individually planned research programs and have a supervised teaching experience along with course work. Students are expected to complete a program of courses in biochemistry and selected courses in modern biology and chemistry.

For information and for application forms, write the Director of Graduate Admissions in Biochemistry, M121 Medical Sciences Bldg., Columbia, MO 65212.

MASTER OF SCIENCE DEGREE: The master of science degree is awarded in part for the completion of a thesis. Entrance requirements are those stipulated for the PhD. In addition, the department offers a University-Industry Cooperative Master of Science track for nontraditional students.

The minimum department course requirements for the master of science degree are six hours of biochemistry and molecular biology, two hours of biochemistry seminar (410), four hours of biochemistry research (490) and one graduate-level course in an area outside the department. Other requirements include a thesis based upon original research, an oral examination, a public seminar based on thesis material and teaching experience. A student is expected to complete an MS degree within a 24-month period.

DOCTORAL DEGREE: The following entrance requirements must be met: mathematics (through differential and integral calculus), biological sciences (at least one course), one year of physics, one year of organic chemistry (with a laboratory), quantitative analysis, a physical chemistry course with a calculus prerequisite and one year of biochemistry (with laboratory). These prerequisites should have been met during the undergraduate curriculum; however, a limited number may be completed after acceptance as a graduate student. Satisfactory completion of a comprehensive examination is expected by the end of the second academic year in graduate study.

The minimum departmental course requirements for the PhD are 12 hours of biochemistry and molecular biology and four hours of seminar (410). Additional requirements include teaching experience, a dissertation based upon original research, a thesis seminar and a final examination.

The average residency of a student with a baccalaureate degree is 4-1/2 years.

MS/MD AND PhD/MD DEGREE PROGRAMS: Students already accepted into the School of Medicine at MU may apply to the department for acceptance into the MS/MD or the PhD/MD program. Students matriculating in either the PhD or MS degree programs must complete degree requirements before entering the School of Medicine.

COURSES

270—Biochemistry (3). First semester of comprehensive biochemistry course: metabolic pathways, amino acids/proteins, carbohydrates, lipids, nucleic acids, kinetics, energy requirements, metabolic regulation in living cells. Prerequisites: one year inorganic chemistry, 5 credits organic chemistry with laboratory. Recommended: Quantitative Analysis. f,w.

272—Biochemistry (3). Second semester of a comprehensive biochemistry course, including metabolism of carbohydrates, fatty acids, steroids, amino acid synthesis and metabolism, molecular genetics, hormones, photosynthesis and integrated metabolism. Prerequisite: 270. f,w.

274—Biochemistry Laboratory (4). Techniques course involving analytical experiments with carbohydrates, lipids, proteins, nucleic acids; use of instrumentation in biochemistry; radioisotope tracers in metabolism; isolation, purification and kinetics of enzymes. Prerequisites: 270 and 272, or 272 concurrently. f,w.

280—Biochemistry of Human Disease (3). Small group learning of medical biochemistry through systematic analyzes of clinical cases. Emphases are on self-learning, group discussions, and teaching one another. Prerequisite: Biochemistry 270 and instructor's consent. Letter grading only.

294—Undergraduate Research in Biochemistry (2-3). Individually directed laboratory research for upperclass students under faculty supervision. Prerequisite: junior standing/instructor's consent required.

295—Honors Research in Biochemistry (2-3). Laboratory research for upper level honors students in consultation with Biochemistry faculty. Prerequisite: Biochemistry Honors Program major; junior standing and instructor's consent.

299—Seminar (1). Discuss journal papers dealing with current topics of research, techniques, status of field, importance of results. Students report on completed undergraduate research projects. Prerequisites: senior standing, a minimum of 10 hours chemistry including a Biochemistry course with laboratory.

300—Problems (1-3).

301—Topics in Biochemistry (1-99). Experimental courses; highly specialized topics taught infrequently or courses taught by visiting professors. Prerequisites: General Biochemistry; others as specified by instructor each semester course is offered.

374—Molecular Biology Laboratory (2). (same as Biological Sciences 374). Emphasizes recently developed genetic and biochemical techniques; illustrates how they apply to contemporary problems in biological research. Prerequisites: Biology 202, Biochemistry 272 or concurrent regristration inBbiology 370.

399—Computer Assisted Sequence Analysis and Molecular Modeling (2). This course uses advanced computer graphics and computational techniques to analyze protein

and nucleic acid sequences and their three-dimensional structures. Prerequisites: chemistry 210 and 211 and instructor's consent. f.

400—Problems (1-6).

401—Plant Biochemistry (3). Emphasizes biochemistry unique to plants; biochemical events plants share with other organisms discussed, compared. Photosynthesis, metabolism, composition, compartmentation, regulation of biochemical events included. Prerequisites: 272 or 320-322 or 304 or instructor's consent. alt. f, odd years.

403—Topics in Biochemistry (1-9). Experimental courses, highly specialized topics taught infrequently or courses taught by visiting professors. Prerequisites: General Biochemistry, other as specified by instructor each semester course is offered.

415—Nutritional Endocrinology (2). The overall objective is to understand the relationships between nutrient requirements, utilization and transport and hormonal factors in normal and disease states. Prerequisites: Biochemistry 270, 272, 274 or instructor's consent. even yrs,f.

422—Analytical Biochemistry—Chromatography (2). Principles, experimental design, capabilities, limitations, and applications of the general field of chromatography of biologically important molecules. Eight (2-hour) lectures, eight (4-hour) labs. Four weeks. Prerequisites: graduate standing or instructor's consent. f.

424—Analytical Biochemistry—Mass Spectrometry (2). Instrumentation, fragmentation mechanisms, interpretation of spectra, combined gas chromatography—mass spectrometry. Eight (2-hour) lectures, eight (4-hour) labs. Prerequisites: two courses in Organic Chemistry, one course in Physics, and instructor's consent. w.

431—Metabolic Regulation (3). This course is designed to give in depth consideration of specific processes and mechanisms used to regulate metabolism, Prerequisites, Biochemistry 270/272.

432—Molecular Biology II (3). Detailed experimental analysis of eukaryotic cellular and molecular biology relevant to cellular and viral gene expression, post-transcriptional and post-translational modifications and genome replication. Models for developmental genetic analysis and genetic determinants controlling developmental processes utilizing the current literature will be examined. w.

433—Molecular Biology of Plant Growth and Development (3). (same as Biological Sciences 433). Molecular biology of plant hormones, signal transduction, environmental signals. Prerequisites: Biological Sciences 313 and 370.

434—Physical Biochemistry (3). Physical concepts underlying a variety of physical chemical methods as they apply to biochemical research. Prerequisites: 270 and 272, or 304 and Chemistry 230, or equivalents. w.

435—Enzyme Kinetics and Mechanism (3). General concepts and experimental methods for study of the mechanism of enzyme action. Prerequisites: 270 and 272, or 304, or equivalents. f

436—Nutritional Biochemistry I (5). (same as Animal Science 436). Nutritional regulation of intermediary and lipid metabolism. Emphasis is on integrating information, interpreting current research data. Prerequisites: Biochemistry 270 and 272; one 300-level nutrition courses. Grades based on classroom participation; case-study reports; and two exams with written and oral components. f.

438—Nutrient Regulation of Gene Expression (3). (same as FS&HN 438). Current concepts with in-depth coverage of several minerals that illustrate themes in molecular mineral nutrition. Based entirely on research literature and taught in a tutorial format. Prerequistes: biochemsitry 270 and 272; 300-level nutrition course.

439—Molecular Biology of Mineral Nutrition (3). (same as Nutrition 439 and Food Science and Human Nutrition 439). Current concepts of metal ion transport, intracellular metal trafficking and metal-dependent regulation of gene expression. Based entirely on research literature and taught in a tutorial format. Prerequisites: Biochemistry 270 and 272; 300-level nutrition course.

440—Hormone Action (2). A lecture course with weekly assigned readings. Topics will include: a description of selected polypeptide, steroid and other hormones and their biological effects; receptors; second messengers; protein phosphorylation in hormone mediation; growth factors; cellular oncogenes. Prerequisites: Biochemistry 270, 272.

450—Research (2-8). Does not include preparation of dissertation.

469—Neurobiochemistry (3). (same as Pharmacology 435). This course is designed to bring up-to-date information on selected biochemical processes occurring in the nervous system. Special emphasis is on the structure and function of neurons, and factors modulating neurotransmitter release and uptake. Prerequisites: Biochemistry 270-272 or equivalent.

477—Crossroads in Biological Chemistry (2). Study of landmark events in the science of biological chemistry. Covers historical background as well as essential elements of theory and experimentation. Readings in the original literature and biographical date. Prerequisites: 270 and 272 or 304 or equivalent. w.

490—Research (1-99). Research in biochemistry for qualified students, with counsel of faculty. Includes preparation of dissertation. Graded on a S/U basis only.

Biological and Agricultural Engineering

College of Agriculture, Food and Natural Resources
College of Engineering
122 Eckles Hall
(573) 882-4113

FACULTY

Jinglu Tan, director of graduate studies, associate professor, PhD, University of Minnesota. Control systems, computer vision, process automation.

Rakesh Bajpai, professor, PhD, Indian Institute of Technology-Kanpur. Transport in bioprocesses, growth kinetics, bioremediation.

Willard Downs, professor, PhD, Oklahoma State University. Material handling/environmental processes, extension.

Allen T. Hjelmfelt Jr., professor, PhD, Northwestern University. Hydrology.

Fu-hung Hsieh, professor, PhD, University of Minnesota. Food extrusion, new food and feed products, food engineering.

Neil F. Meador, professor, PhD, Michigan State University. Structural design.

Dennis M. Sievers, professor, PhD University of Missouri-Columbia. On-site sewage systems, animal waste management, environmental ethics.

David E. Baker, associate professor, MS, Illinois State University, Farm safety.

Steven C. Borgelt, associate professor, PhD, Texas A&M University. Machine design, sensors and controls.

Charles Fulhage, associate professor, PhD, University of Missouri-Columbia. Waste management, pollution control, water quality, extension.

Eugene L. Iannotti, associate professor, PhD, University of Maryland. Bioprocessing related to development of new products and reduction of waste.

Donald Pfost, associate professor, PhD, The Ohio State University. Waste management/water quality, extension.

Leon G. Schumacher, associate professor, PhD, Iowa State University. Teaching agricultural mechanics, biofuels.

Allen Thompson, associate professor, PhD, University of Nebraska. Irrigation management, erosion mechanics, wetland hydrology.

William Casady, extension assistant professor, PhD, University of Illinois. Conservation tillage.

Patricia Darcy, assistant professor, PhD, University of Iowa. Bioprocessing, protein crystallization.

Dan Ess, assistant professor, PhD, Virginia Polytechnic Institute & State University. Development and analysis of knowledge-intensive agricultural systems.

John Hoehne, extension assistant professor, MS, University of Missouri-Columbia. Waste management, swine.

Winston Su, assistant professor, PhD, Lehigh University. Bioprocessing, bioreactor design.

Kenneth A. Sudduth, assistant professor, PhD, University of Illinois. Sensors and controls for crop production, agri-chemicals application.

Joseph Zulovich, extension assistant professor, PhD, University of Nebraska-Lincoln. Structures, animal housing, commercial agriculture.

DEGREES: MS, ME and PhD in biological engineering or agricultural engineering

The Department of Biological and Agricultural Engineering offers graduate programs leading to a master of science, master of engineering or doctor of philosophy degree in biological engineering or agricultural engineering.

Thesis research may emphasize bioprocessing, food engineering, environmental engineering, biochemical engineering, biomedical engineering or precision agriculture. Laboratories are well equipped for research in bioprocessing, bioreactor design, value-added processes and products, properties of biological and food materials, food extrusion, water quality, wetlands, process control, computer vision, GIS, precision agriculture, chemical application technology, soil physics, hydrology, and renewable energy. Research assistantships are available to qualified graduate students.

For more information regarding the graduate programs and financial support, visit the web site at www.fse.missouri.edu or write to the Director of Graduate Studies, 122 Eckles Hall, Columbia, MO 65211.

MASTER OF SCIENCE DEGREE: Candidates for the MS degree are expected to have a BS degree in engineering. Students without a BS in engineering will be required to complete additional courses in mathematics, basic sciences, and engineering science. Students with engineering degrees other than biological or agricultural engineering should meet certain proficiency requirements.

An MS student must complete a minimum of 30 credit hours of graduate work, with at least 15 hours in 400-level courses. A maximum of 40 percent of the total credit hours may be in research or special problems. A thesis is required.

MASTER OF ENGINEERING DEGREE: Students entering the ME degree are expected to have a BS in engineering. A GPA of 3.0 for the

last 60 hours of BS course work is normally required. An acceptable GRE score is also necessary.

An ME student must complete a minimum of 36 credit hours of graduate work. At least 15 hours must be in 400-level courses and a minimum of 21 hours must be from the College of Engineering. The student must maintain at least a 3.0 cumulative GPA and complete the program in 8 years. A project may be required by the adviser.

DOCTORAL DEGREE: Students pursuing a PhD degree should have a prior engineering degree, preferably MS, or complete additional course work as described for the MS degree. Within the first year in the program, each PhD student must pass a qualifying examination before continuing enrollment. The exam is designed to test the student's ability to undertake advanced learning and carry out independent research.

A doctoral candidate must complete a minimum of 72 credit hours of course work beyond the BS degree with a minimum of 15 hours in 400-level courses excluding problems and research. The courses and research plan must be approved by the doctoral program committee. The student is required to pass a comprehensive examination, which includes both written and oral components. The student must demonstrate his or her ability for in-depth research by presenting and successfully defending a dissertation embodying the results of original research. A foreign language is not required.

COURSES

BIOLOGICAL ENGINEERING

201—Topics in Biological Engineering (3). Current and new technical developments in biological engineering. Prerequisite: instructor's consent.

203—Environmental Control for Biological Systems (3). Systems for controlling the physical environments (heat, moisture, light, contaminating organism, chemicals) for plant and animal systems including livestock, aquacultures, crops, and agricultural products. Prerequisites: Engineering 99 and Mathematics 304, concurrent.

210—Principles of Biological Engineering I (3). Characteriszation of biological phenomena in engineering design; relationships among paramerters using linear and nonlinear statistical expressions; case studies of engineering design solutions. Prerequisites: Biology 1 and 2, Math 80.

260—Engineering Properties of Biological Materials (3). Definition, measurement and applications of mechanical, thermal, electromagnetic and biochemical properties of biological materials pertinent to biosystems modeling, design, analysis and optimization. Effects of materials composition and structure on material properties. Prerequisite: AE 210. Correquisite: Physics 176 and Engr 195.

300—Problems (1-5). Supervised independent study at the undergraduate level. Prerequisite: instructor's consent.

301—Topics in Agricultural Engineering (3). Current and new technical developments in agricultural engineering. Prerequisite: instructor's consent.

302—Design of Livestock Waste Management Systems (3). Development and application of design criteria to the design of agricultural waste management facilities. Prerequisites: Chemistry 31 and CE/MAE 251 or instructor's consent.

310—Principles of Biological Engineering II (3). Application of transport phenomena to biological systems. Theory and examples of fluid mechanics, heat transfer and mass transfer. Prerequisites: BE 210 and Thermodynamics Course.

311—Soil and Water Conservation Engineering (3). Analysis of run-off and erosion from urban and agricultural lands. Design and layout of erosion control structures. Prerequisites: CE/MAE 251 or BE 210. Graded on A/F basis only. f.

315—Applied Electronic Instrumentation (4). Fundamental concepts and theories, basic electronics, analog and digital circuits, signal conditioning, computer interfacing, measurement principles and techniques used in developing computer-based instrumentation systems. Prerequisite: Physics 176.

321—Irrigation and Drainage Engineering (3). Soil, water, plant relationships. Water supplies and design of surface sprinkler and trickle irrigation systems. Surface and tile drainage. Prerequisite: CE/MAE 251 or BE 210. Graded on A/F basis only.

340—Mechanical Systems Engineering (3). Fundamentals and applications of prime movers and power transmissions for the design of engineering systems. Prerequisite: Thermodynamics course, CE 251. Corequisite: Engineering 124 or BE 315 or instructor's consent.

351—Food Process Engineering I (3). Study of transport phenomena and unit operations in food processing systems. Emphasis on rheology of food heating and cooling processes and thermodynamics of food freezing. Prerequisite: BE 210 or instructor's consent.

361—Food Process Engineering II (3). Continuing study of transport phenomena and unit operations in food processing systems. Emphasis on fluid food evaporation concentration food dehydration, contact equilibrium processes and mechanical separation processes. Prerequisite: AE/BE 351 or instructor's consent.

390—Engineering Internship (2-5). Problem course following prior approved work experience. Problem selected by internship company representative, faculty problem adviser and student. Supervised by faculty problem adviser and presented in engineering report form. Prerequisite: adviser's consent.

395—Agricultural Engineering Design (3). Capstone design course for the agricultural engineering major. Design of agricultural system devices or processes. Prerequisite: senior standing or instructor's consent.

400—Problems (1-99). Supervised individual study at the graduate level.

401—Advanced Topics in Agricultural Engineering (1-3). Study of advanced developments in agricultural engineering.

402—Natural Systems for Wastewater Treatmemt (3). Emphasis is on the design, management and biological performance of lagoons, overland flow systems and constructed wetlands. Prerequisites: Civil Engineering 391 and AE/BE 311 or instructor's consent.

410—Seminar (1). Recent investigations in agricultural engineering and related fields. Discussion of current literature; preparation and presentation of papers.

412—Research Methods (1). Review of literature; planning research projects; publication procedures. Prerequisite: graduate standing.

416—Numerical Methods in Engineering Research (3). Numerical techniques and case studies in Biological Engineering. Topics include basic numerical methods, mathematical representation of data, matrix algebra, ordianary and partial differential equations. Prerequisites: Mathematics 304.

421—Water Management Theory (3). Advanced studies in erosion control, irrigation, and drainage. Water resources engineering. Prerequisites: Mathematics 80, Computer Science course, Agronomy 307 and Soil Conservation course.

461—Food Extrusion (2). Engineering principles and applications of single and twin screw food cooking extrusion systems. Modeling, control and optimization of extrusion systems. Dough rheology. Prerequisite: AE/BE 361.

470—Modeling and Identification of Engineering Systems (3). Generalized description of engineering systems, bond graph modeling, system identification techniques, and neural network approaches. Prerequisite: Mathematics 304.

490—Research (1-99). Independent investigation to be presented as a thesis. Graded on a S/U basis only.

AGRICULTURAL ENGINEERING

203—Environmental Control for Biological Systems (3). (same as Biological Engineering 203). Systems for controlling the physical environments (heat, moisture, light, contaminating organism, chemicals) for plant and animal systems including livestock, aquacultures, crops and agricultural products. Prerequisite: Engineering 99 and Math 304.

300—Problems (1-5). Supervised independent study at the undergradute level. Prerequisite: instructor's consent.

301—Topics in Biological Engineering (3). (same as Biological Engineering 301). Current and new technical developments in biological engineering. Prerequisite: instructor's consent.

302—Design of Livestock Waste Management Systems (3). (same as Biological Engineering 302). Development and application of design criteria to the design of agricultural waste management facilities. Prerequisites: Chemistry 31 and CE/MAE 251 or instructor's consent.

311—Soil and Water Conservation Engineering (3). (same as Biological Engineering 311). Analysis of run-off and erosion from urban and agricultural lands. Design and layout of erosion control structures. Prerequisites: CE/MAE 251 or BE 210.

315—Applied Electronic Instrumentation (4). (same as Biological Engineering 315). Fundamental concepts and theories, basic electronics, analog and digital circuits, signal conditioning, computer interfacing, measurement prinicples and techniques used in developing computer-based instrumentation systems.

321—Irrigation and Drainage Engineering (3). (same as Biological Engineering 321). Soil, water, plant relationships. Water supplies and design of surface sprinkler and trickle irrigation systems. Surface and tile drainage. Prerequisites: CE/MAE 251 or BE 210.

340—Mechanical Systems Engineering (3). (same as Biological Engineering 340). Fundamentals and applications of prime movers and power transmissions for the design of engineering systems. Prerequisites: Thermodynamics course, CE 251. Corequisite: Engineering 124 or BE 315 or instructor's consent.

350—Honors Thesis Research (2-4). Open only to honor students in biological engineering. Independent investigation in biological engineering to be presented as a thesis.

351—Food Process Engineering I (3). (same as Biological Engineering 351). Study of transport phenomena and unit operations in food processing systems. Emphasis on rheology of food heating and cooling processes and thermodynamics of food freezing. Prerequisite: BE 210 or instructor's consent.

361—Food Process Engineering II (3). (same as Biological Engineering 361). Continuing study of transport phenomena and unit operations in food processing systems. Emphasis on fluid food evaporation concentration food dehydration, contact equilibrium processes and mechanical separation processes. Prerequisite: AE/BE 351 or instructor's consent.

390—Engineering Internship (2-5). Problem course following prior approved work experience. Problem selected by internship company representative, faculty problem adviser and student. Supervised by faculty problem adviser and presented in engineering report form. Prerequisite: adviser's consent.

395—Biological Engineering Design (3). (same as Biological Engineering 395). Capstone design course for the biological engineering major. Design of biological system

devices or processes. Prerequisite: senior standing or instructor's consent.

402—Natural Systems for Wastewater Treatment (3). Emphasis is on the design, management and biological performance of lagoons, overland flow systems and constructed wetland. Prerequisite: Civil Engineering 391 and AE/BE 311 or instructor's consent.

490—Research (1-99). Independent investigation to be presented as a thesis. Graded on S/U basis only.

AGRICULTURAL SYSTEMS MANAGEMENT

201—Surface Water Management (3). Topics include hydrology; soil erosion precautions; elementary surveying; selection and layout of ponds, terraces and water control structures. Prerequisites: Mathematics 10 and Junior standing. w.

202—Water Quality and Pollution Control (3). Applies scientific principles to a variety of water quality problems arising from activities associated with nonpoint pollution, agricultural chemicals, land disposal of wastes, on-site sewage disposal and individual drinking water systems. Prerequisites: general Inorganic Chemistry, Mathematics 10, and junior standing. f.

210—Advanced Agricultural/Industrial Materials and Processes (2-3). Primarily for students majoring in agricultural education. Applies shop principles to the design and construction of projects. Prerequisite: ASM 20 or instructor's consent. f.

215—Electricity: Wiring and Equipment (3). Home and agricultural electricity; emphasis on proper selection and use of electrical wiring materials and equipment. Basic electrical theory. Prerequisite: junior standing. f.

240—Agricultural Equipment and Machinery (3). Operation of agricultural machinery. Selection and management of equipment. Prerequisite: junior standing. w.

286—Material Handling & Conditioning (3). Principles required for processing and handling food and feed materials; selection of machines; analysis and development of systems for processing and handling grain. Prerequisite: Mathematics 10, junior standing or instructor's consent. w.

300—Problems (1-5). Supervised independent study at the undergraduate level. Prerequisite: instructor's consent. f,w,s.

301—Topics in Agricultural Mechanization (3). Current and new technical developments in agricultural mechanization. Prerequisites: 6 hours in Agricultural Engineering or instructor's consent. f,w,s.

310—In-Service Course in Agricultural Mechanization (1-8). A. Farm Power and Machinery B. Farm Buildings and Conveniences C. Soil and Water Management D. Rural Electrification and Processing E. Agricultural Construction and Maintenance Basic principles relating to agricultural mechanization. Applies principles and subject matter in successful classroom presentation at the high school level. Prerequisites: 10 credits from courses 1, 20, 80, 103, 201, 210, 215 and 240; a B.S. degree in Agriculture or instructor's consent. s.

320—Irrigation and Drainage (3). Soil, water, plant relationships. Selection and layout of irrigation and drainage systems. Prerequisites: 201 or instructor's consent. f.

330—Agricultural Accident Prevention (3). Analysis, organization and implementation of agriculture safety and health programs. Physical and economic impacts of accidents, standards and liabilities. Role of man in the man-machine system. Prerequisite: instructor's consent. w.

363—Agricultural Systems Management (3). Capstone course required of Agricultural System Management majors. Team project involving extensive use of the students education and requiring comprehensive written ond oral reports are required. It includes selection, replacement and cost calculation of machine systems; an introduction to linear programing project scheduling; and an introduction to maintenance management techniques. Prerequisites: 15 semester hours of ASM courses (100-level or above) and senior standing. f.

390—Agricultural Systems Management Internship (2-5). Problem course following prior approved internship work experience. Problem selected by internship company representative, faculty problem advisor and student. Supervised by faculty problem advisor and presented in technical report form. Prerequisite: senior standing. f,w,s.

Biological Sciences

College of Arts and Science
218 Tucker Hall (573) 882-1847, 1-800-553-5698

FACULTY

John D. David, director, associate professor, PhD, Vanderbilt University.

Gerald Summers, associate director, associate professor, PhD, Duke University.

Timothy Holtsford, director of graduate studies, associate professor, PhD, University of California-Riverside.

Andrew McClellan, director of graduate recruitment, associate professor, PhD, Case Western Reserve University.

Steven Alexander, professor, PhD, Brandeis University.

James Birchler, professor, PhD, Indiana University.

James E. Carrel, professor, PhD, Cornell University.

John Faaborg, professor, PhD, Princeton University.

Candace Galen, professor, PhD, University of Texas-Austin.

H. Carl Gerhardt, professor, PhD, University of Texas-Austin.

Philip Jen, professor, PhD, Washington University-St. Louis.

Donald Miles, professor, PhD, Indiana University.

Kathleen Newton, professor, PhD, Indiana University.

Donald L. Riddle, professor, PhD, University of California-Berkeley.

Raymond Semlitsch, professor, PhD, University of Georgia.

George Smith, professor, PhD, Harvard University.

Fred vom Saal, professor, PhD, Rutgers University.

John Walker, professor, PhD, University of Georgia.

Richard J. Wang, professor, PhD, University of Colorado.

Tobias Baskin, associate professor, PhD, Stanford University.

Linda F. Chapman, associate professor, PhD, University of California-Los Angeles.

Karen Cone, associate professor, PhD, Indiana University.

Miriam Golomb, associate professor, PhD, University of California-Berkeley.

Mark Kirk, associate professor, PhD, Rice University.

Joel Maruniak, associate professor, PhD, University of Texas-Austin.

Thomas E. Phillips, associate professor, PhD, Northwestern University.

David L. Worcester, associate professor, PhD, Harvard University.

Anand Chandrasekhar, assistant professor, PhD, University of Iowa.

Catherine Krull, assistant professor, PhD, University of Arizona.

Emmanuel Liscum, assistant professor, PhD, The Ohio State University.

Steven Nothwehr, assistant professor, PhD, Washington University-St. Louis.

DEGREES: MA and PhD in biological sciences

General areas of research emphasis within the division include evolutionary biology, ecology and behavior; genetic, cellular, molecular and developmental biology; neurobiology and behavior; and plant sciences. Within these general areas, students may devise more specific graduate programs in, for example, plant genetics, invertebrate chemical communication or neurophysiology. Several students are currently involved in interdepartmental programs in neurosciences, genetics, plant biochemistry and physiology, cellular and molecular biology, Conservation Biology Program, microbiology and physiology. In addition, the presence on this campus of a School of Medicine, College of Agriculture, Food and Natural Resources and College of Veterinary Medicine provides opportunities for direct interaction with a variety of established research scientists. Faculty in the division also participate in the Genetics Area Program, the Pathobiology Area Program, the Molecular Biology Program and the Interdisciplinary Program in Plant Biochemistry and Physiology and the Conservation Biology Program.

All entering graduate students should have a broad background in biology and should have completed courses in mathematics through integral calculus, chemistry through organic chemistry and a year of physics. Exceptions may be made for individual students. Outstanding students with undergraduate degrees in areas other than biology (such as chemistry, physics, mathematics or psychology) are encouraged to apply, with the understanding that subject matter in biology will be addressed in the first year of graduate study.

Financial support is available through research training grants, fellowships, scholarships, or graduate research or teaching assistantships. ***For more detailed information on stipend level and availability of various kinds of financial support, including University fellowships for superior students, write Graduate Admissions, 218 Tucker Hall, Division of Biological Sciences, University of Missouri-Columbia, Columbia, MO 65211. E-mail: EmerichN@missouri.edu or call 1-800-553-5698.***

The division is housed in Tucker Hall and Lefevre Hall, both of which are next to buildings that house the chemistry and physics departments and related departments in the College of Agriculture, Food and Natural Resources and the School of Natural Resources. The School of Medicine and the College of Veterinary Medicine are within a short walking distance. Campus research units with which the division has cooperative research programs include the Dalton Cardiovascular Research Center, the Research Reactor Center, the Laboratory for Biological Control of Insects, the Cancer Research Center, the Eye Research Center and the Agricultural Experiment Station Laboratories.

Besides the specialized equipment in each faculty research laboratory, departmental equipment and facilities available to graduate students include a 250,000-specimen herbarium; five greenhouses; a 14-acre botany preserve on the campus and a 160-acre prairie research station; 24 walk-in plant growth chambers with regu-

lated light, temperature and humidity controls; animal-care facilities suitable for bats, rats, rabbits and amphibians; cell and tissue culture facilities; growth chambers; DNA sequencing and recombinant DNA facilities; scanning spectrophotometers and kinetic fluorimeters; ultracentrifuges; HPLC facilities; sound isolation acoustic chambers; neurophysiological recorders, oscilloscopes and amplifiers; and microneurosurgery facilities and equipment. Divisional faculty have ready access to the campus computing network and microcomputers in their laboratories.

MASTER'S DEGREE: Each candidate for the master's degree is required to complete a minimum of 30 hours of credit beyond the bachelor's degree, selected from courses carrying graduate credit and including the Professional Survival Skills Course and at least one other course in which the candidate will present a seminar. Candidates also must satisfactorily complete a research project, a thesis and an oral thesis defense. Most students require two years to complete the work for a master's degree.

DOCTORAL DEGREE: Each candidate for the doctoral degree is required to complete a minimum of 72 hours of credit beyond the bachelor's degree, selected from courses carrying graduate credit and including the Professional Survival Skills Course and at least two other courses in which the candidate will present a seminar. Candidates must satisfactorily complete a written comprehensive examination, a research project, a dissertation and an oral dissertation defense. Because many students eventually pursue both research and teaching careers, all doctoral candidates are strongly encouraged to gain teaching experience by assisting a professor in one lecture/laboratory course for at least one semester, sometime during their graduate training, no matter their source of financial support. Requirements for the PhD degree are generally completed in 5.3 years as compared to the national average of six years.

COURSES

201—Topics in Biological Sciences (1-99). Selected topics not covered in regularly offered courses. Prerequisite: a course in general biology.

202—General Genetics (4). Principles of inheritance in plants and animals; structure and use of genetic material, transmission of genetic information, linkage, modification of genetic information, regulation of genetic activity, population genetics. Prerequisites: 10, Chemistry 12 (or concurrent enrollment)

203—Introduction to Cell Biology (3). Study of structure and function at the cellular and subcellular level. Prerequisite: 10 and Chemistry 210, or equivalent, or concurrent enrollment in Chemistry 210. f,w.

207—Biology of Fungi (3). (same as Plant Science 207). The diverse roles of fungi in the biosphere will be explored by considering fungi we eat, fungi which destroy or food, fungi in folklore and fungi as global nutrient recyclers. Prerequisite: 10, 11, or 12.

208—Introductory Entomology (2-3). (same as Entomology 208). Holistic biology of insects, including anatomy, physiology behavior, ecology, and management. Prerequisites: Biological Sciences 10, 11, or 12 or equivalent.

209—Insect Diversity (1). (same as Entomology 209). Laboratory emphasizing external insect anatomy, classification, and identification to the family level. Insect collection is required. Prerequisite: concurrent enrollment or previous satisfactory completion of Entomology/Biology 208.

210—Parasitology (4). (same as Veterinary Pathobiology 210). Parasitism is considered as a fundamental type of inter species interaction. Principles of parasitism as they apply to animals are presented with emphasis on parasite morphology, biology and host parasite relationships. Prerequisite: 8 hours of biology.

212—Basic Microbiology (4). Principles of microbiology. Prerequisite: 202 and 203. w.

214—Plant Taxonomy (4). Principles of classification of plants; survey of diversity in flowering plant families; identification of local flora; use of keys. Prerequisite: 1 semester biology or botany.

230—Invertebrate Zoology (4). Structure, ecology and phylogeny of the invertebrate phyla. Prerequisites: 10 or 11. f.

241—Genetics Laboratory (2). Experimental genetic studies of Drosophila, corn and microorganisms. Prerequisites: a grade of C or better in 202 or instructor's consent. w.

250—Community Biology (3). Integrated set of lectures on evolution/population genetics, population dynamics/social systems and ecosystem structure/ process, biomass in worldwide context, man in the environment. Prerequisites: 1, 10, 11 or 12 equivalent. f.

266—Ornithology (4). (same as Fisheries and Wildlife 266). Structure, identification, habits, importance of regional birds. Field work, lectures, lab. Prerequisites: 5 hours Biology or instructor's consent.

270—Animal Physiology (5). Introduces concepts of vertebrate organ function and homeostatic control emphasizing mammalian physiology. Some comparisons to function in other vertebrates and strategies for coping with environmental stresses introduced. Prerequisite: 10 and Chemistry 12 (or concurrent enrollment in Chemistry 12)

293—Undergraduate Research in Biology (1-3). Individually directed field or laboratory research for upper- class students under faculty supervision. Project must be arranged by student and faculty member prior to registration. Prerequisites: Overall GPA 2.75; 20 hours of biology and/or chemistry; instructor's consent.

294—Undergraduate Research in Biology (1-3). Individually directed field or laboratory research for upper- class students under faculty supervision. Project must be arranged by student and faculty member prior to registration. Prerequisites: 293; overall GPA 2.75.

295—Honors Research in Biology (1-3). Special field or laboratory problems of experimental nature for upper-level Honors students, in consultation with instructor. Prerequisites: overall GPA 3.3, biological sciences or microbiology major, and instructor's consent. f,w,s.

296—Honors Research in Biology (1-3). Continuation of research program. Successful completion leads to degree with Honors in biological sciences or microbiology. Prerequisites: 295; overall GPA of 3.3; instructor'r consent. f,w,s.

300—Problems in Biological Sciences (1-99). Individual supervised work to supplement regularly organized courses in biology; introduction to research. Prerequisites: upper-level standing and instructor's consent. f,w,s.

301—Topics in Biological Sciences (1-99). Selected topics not in regularly offered courses. Prerequisite: instructor's consent. f,w,s.

302—Evolution (3). Surveys various processes in organic evolution and underlying genetic mechanisms. Prerequisites: 202. w.

303—Photosynthesis Lecture (3). Discussion of genetics, development and evolution of the chlorplast related to the basic biochemical and bioenergetic function of photosynthesis. Impact of environmental factors on the physiology and biochemistry of phyotosynthesis will be presented. Prerequisite: 203 or a course in general biochemistry.

308—Plant Anatomy (4). Comparative structure, growth of meristems; development, structure of important cell types, tissues, tissue systems; comparative anatomy of stem, root, leaf. Emphasizes anatomy of gymnosperms, angiosperms. Prerequisites: 10 or 12. w.

309—Mammalogy (4). (same as Fisheries & Wildlife 307). Taxonomy, distribution, structure, habits, importance of mammals; emphasizes those of central United States. Prerequisites: junior standing or instructor's consent. f.

311—Ichthyology (4). (same as Forestry, Fisheries & Wildlife 311). A broad introdcution to the biology and ecology of fishes. Emphasis will be placed on understanding the adaptations fishes exhibit to aspects of their environment. Prerequisites: 8 hours biology or equivalent.

316—Principles of Insect Physiology (4). (same as Entomology 316). f, alt. years.

317—Plant Physiology (3-5). (same as Plant Science 317). Modern physiology of higher plants using common cultivated plants as examples. May be taken with or without laboratory. prerequisite: 10 or 12 and 5 hours chemistry.

324—Limnology (3-4). (same as Fisheries & Wildlife 324). f.

325—Herpetology (4). The biology, ecology, taxonomy, and distribution of amphibians and reptiles. Some Saturday field trips. Prerequisite: 8 hours Biology or equivalent. f.

326—Analysis of Biological Macromolecules (3). Theory/ application of techniques used for characterization of proteins, nucleic acids; topics; sedimentation velocity, equilibrium; sucrose density gradients; electrophoresis; spectrophotometry. Prerequisites: 203 or Biochemistry 270; Mathematics 80 and one year Physics. w, alt. years.

328—Introductory Radiation Biology (3). (same as Nuclear Engineering 328, Radiology 328, Veterinary Medicine and Surgery 328). f.

330—Developmental Biology (3). Analysis of the molecular, genetic, cellular, and morphological processes responsible for phenotypic changes in developing organisms. A variety of experimental systems are discusses to identify common mechanisms used by developing organisms. Prerequisites: 202, 203, Chemistry 210.

333—Vertebrate Histology and Microscopic Anatomy (5). Microscopic anatomy of vertebrate tissues and organs. Prerequisites: junior standing; 203 and 270, or equivalent are recommended.

335—Mammalian Reproductive Biology (3). Adult reproductive anatomy, physiology and behavior; gametogenesis and fertilization; placentation; sexual differentiation; parturition; maternal behavior and lactation; puberty; reproductive aging; reproductive ecology. Prerequisites: junior standing and 15 hours of Biology. w.

337—Neural Control and Regeneration in Motor Systems (3). Examination of the function of neural networks at all levels, from properties of single neurons to large collections of neural elements. Prerequisites: 270 or instructor's consent.

339—Neurobiology (3). Vertebrate and invertebrate neurobiology, including cell and molecular biology of the neuron, neurophysiology, neuroanatomy, neuroethology and developmental neurobiology. Prerequisites: 203 or 270 or instructor's consent. f.

341—Neurobiology Laboratory (3). Laboratory experience with experimental neurobiology, with emphasis on neural networks, motor systems, and developmental neurobiology. Prerequisites: 270 or 339 or instructor's consent.

342—Behavioral Biology (3). Comparative study of animal ethology. Principles of animal ethology illustrated in different animal phyla. Prerequisites: 10 and one additional upper-level course in Biology or Psychology. f.

343—Nerve Cells and Behavior (3). The cellular basis of behavior. Molecular and cellular properties of nerve cells, as related to behavior, will be represented and discussed. Prerequisite: 270 or instructor's consent.

350—Special Readings in Biological Sciences (1-99). Independent readings and discussions of topics in biology selected in consultation with supervising faculty member. Paper required. Prerequisites: senior or graduate standing in biology and instructor's consent.

362—General Ecology (5). Principles of populations, coevolution, density factors, competition; physical environment; concept of community, trophic structure, biotic succession; characterization of biomes, man in ecosystem. Biology majors having completed 250: 2 hours credit. Prerequisites: 10 hours in Biology and junior standing. f.

364—Plant Population Biology (4). Covers the ecological and evolutionary processes that influence the distribution and abundance of plant species. Topics include evolution of life history schedules, gender evolution, population growth and demography, competition, herbivory, plant-pollinator interactions, clonal growth, and plant community structure. Prerequisites: 2 courses in biology.

366—Avian Ecology (3). Advanced examination of ecological patterns in birds. Explores the environmental factors affecting the evolution of avian behavior, morphology, community structure and distribution. Prerequisites: 250 or 362; 266. w, alt. years.

370—Molecular Biology (3). Molecular mechanisms of DNA replication, mutation, recombination and gene expression in prokaryotes, eukaryotes, and their viruses; gene fine structure; genetic engineering. Prerequisites: 202 and 203.

371—Cellular Physiology (5). The cell as a functional unit. Prerequisites: 10 hours Biology and 5 hours Physics and 5 hours Organic Chemistry; some background in Biochemistry and/or Molecular Biology is strongly recommended. May be taken as lecture-only (3 hour credit) by graduate students or with instructor's consent. f.

374—Molecular Biology Laboratory (2). (same as Biochemistry 374). Emphasizes recently developed genetic and biochemical techniques; illustrates how they apply to contemporary problems in biological research. Prerequisites: 202, Biochemistry 272 or concurrent registration in Biological Science 370. f.

375—Human Inherited Diseases (3). Analysis of the molecular and cellular mechanisms underlying inherited diseases in humans. topics include genetics of sex determination, metabolic disorders, cancer, blood groups, transplantation, AIDS. Prerequisites: 202 and 203.

399—Senior Seminar (1-3). Readings and critical evaluation of selected problems and theories in biology. Offered in one or more sections, with specialized subdisciplinary emphasis. Prerequisites: Biology major, senior standing, instructor's consent.

400—Problems in Biological Sciences (1-99). Research not expected to terminate in thesis, or individual advanced study in special subjects. Prerequisites: graduate standing and instructor's consent. f,w,s.

401—Topics in Biological Sciences (1-99). Advanced topics not in regularly offered courses. Prerequisite: instructor's consent. f,w,s.

405—Professional Survival Skills (2). Introduction to resources, facilities, and communication skills for professional careers in biological sciences. Topics include computer resources, accessing scientific literature, making slides and figures, grantmanship, resume preparation, manuscript review, and research presentation.

408—Developmental Genetics (3). Discussion and analysis of selected regulatory mechanisms in development, with major emphasis on the regulation of gene transcription. Prerequisites: 202 and Biochemistry 270, Biochemistry 272, or equivalent; graduate standing. w, alt. years.

410—Seminar (1). Current topics in the biological sciences. Open to all graduate students. Offered S/U. Prerequisite: graduate standing. f,w.

411—Seminar in Areas of Specialization (1). Offered each semester in one or more specialized sections followed by the topic title of the seminar. May be offered S/U. Prerequisite: graduate standing.

412—Seminar in Genetics (1). Discussion of current investigations in genetics. Prerequisite: graduate standing.

413—Workshop in Area of Specialization (1). Intensive course in the theory and methodology of biological investigation. Conducted by visiting scientists. Offered in one or more specialized sections. Prerequisites: graduate standing or instructor's consent. May be repeated for credit.

418—Advanced Plant Genetics (3). Genetic approaches to molecular and biochemical studies in maize, wheat, and Arabidopsis. Prerequisites: General Genetics and course in Cell Biology or Plant Physiology. w, alt. years.

421—Design of Ecological Experiments (2). Principles of experimental design in the context of ecological, behavioral, and evolutionary research. Prerequisite: Statistics 207.

422—Ecological Genetics (4). Population genetics and evolutionary theory, with emphasis on studies of natural populations. Prerequisites: 202, 250 or 362, and Statistics 207 or equivalent. f, odd years.

425—Plant/Animal Interactions (3). Discussion and lectures on herbivory, pollination biology, and dynamics of fruit and seed dispersal from ecological and evolutionary perspectives. Prerequisites: 362 or 364 or equivalent.

428—Advanced Community Ecology (3). Detailed examination of new happenings in population and community ecology. Topics vary but will include species interactions, community structure, reproductive strategies. Prerequisites: 362 or instructor's consent. alt. years.

430—Speciation (2). Discussion of factors involved in the process of speciation with an emphasis on macroevolution. Prerequisites: 202 and 302. f.

432—Advanced Cell Biology (3). Structure and function of membranes; cell ultrastructure; organellar function; cellular movement; microtubules; microfilaments; mitosis and meiosis. Prerequisites: 203; graduate standing; instructor's consent.

433—Molecular Biology of Plant Growth and Development (3). (same as Biochemistry 433). Molecular biology of plant hormones, signal transduction, environmental signals. Prerequisites: Biological Sciences 313 and 370.

437—Advanced Microscopy Techniques (3). Electron microscopy and modern light microscopy techniques including epiflourescence, confocal flourescence microscopy, low light video microscopy, differential interference optics, and computerized image analysis. Prerequisite: 333 or 432 and instructor's consent.

441—Neurobiological Techniques (4). Principles and techniques of experimental neurobiology. Participants will complete an independent research project. Prerequisite: 270 or 339 or consent.

442—Sensory Physiology & Behavior (3). Basic principles of coding and integration of sensory stimuli; neural correlates of animal behavior; environmental influences on postnatal sensory development. Prerequisite: 339 or equivalent. w.

445—Developmental Neurobiology (3). Principles of neural development. Development of neuron and nerve patterns, axon growth, synapses, and development of behavior. Prerequisite: 339 or equivalent. w, alt years.

450—Non-thesis Research (1-99). Independent research not leading to a thesis. Prerequisites: graduate standing and instructor's consent.

490—Research in Biological Sciences (1-99). Research leading to thesis or dissertation. Prerequisites: graduate standing and instructor's consent. Graded on a S/U basis only.

Black Studies Area

313 Gentry Hall (573) 882-6229

An individual program of specialization in Black Studies may be arranged within the framework of a conventional graduate degree in any one of several fields. The options within a regular degree program are employed to include maximum exposure to courses emphasizing the African-American background and experience. Courses outside the major department, but in related fields, are incorporated into the student's study plan.

Students interested in pursuing a Black Studies specialty within their chosen fields should consult a departmental adviser, who is an affiliate of the Black Studies Program, to assist in course selection. Lacking such an adviser, students should contact the director of the Black Studies Program.

COURSES

200—Special Problems (1-99). Research apprenticeship with faculty member, assisting a faculty member in the development and execution of a research project. May be repeated for a maximum of six hours. Prerequisite: sophomore standing, instructor's consent.

201—Undergraduate Topics in Black Studies (1-3). Organized study of selected topics. Subjects and credit may vary from semester to semester. Prerequisite: program consent for repetition. Prerequisite: sophomore standing.

204—Survey of African-American Literature (3). (Same as English 204.) A genre-focused survey of African- American literature from the Harlem Renaissance to the present. Courses may focus on the move, the essay and other nonfiction forms, poetry, and drama. Prerequisite: 20.

225—African American Psychology (3). (same as E&CPSY A225). The research, theories, and paradisms developed to understand the attitudes, behaviors, and psychosocial realities of African-Americans are discussed. Prerequisite: Psychology 1.

226—Black Feminism (3). (same as E&CPSY A226). This course outlines the basic principles and practices of Black feminism in the United States. Examination of the multiple systems of oppression on Black women's lives and Black women's collective actions against social structures will occur. Prerequisite: Psychology 1 or instructor's consent.

234—Black Religion (3). (Same as Religious Studies 234.) A history of religion approach to the study of black religion which takes into consideration the unique past experiences of the African American community as it underwent the terror of forced migration, slavery, segregation, and discrimination. Prerequisite: sophomore standing.

237—Women in African History (3). (same as Women Studies 237 and History 237) Focuses on the varied and changing roles of women in sub-Saharan Africa from precolonial times to the present. Prerequisite: sophomore standing or instructor's consent.

240—Black Freedom Movement, 1955-1973 (3). (same as History 240). Examines the dismantling of American apartheid and its transformation into a new racial control system. It also explores how and why the Civil rights Movement was converted into a struggle for Black Power. Offered once a year.

246—History of Black Nationalism in the United States (3). (same as History 246). Examines the struggle of African-Americans tp construct autonomous institutions, to build all Black communities or to acquire an independent nation-state. We will study the ideology, structure, strategy and tactics. Prerequisites: History 130 or Sociology 139.

250—Black Women in American Politics (3). (Same as

Political Science 250.) This course analyzes the role that Black women have played in American politics from the Reconstruction era civil rights and women's movements, and bids for elective official. Prerequisite: Political Science 1 or 11 and sophomore standing.

260—Black Political Thought (3). (Same as Political Science 260.) This course analyzes the major political theories and their proponents from the Reconstruction era to the present. Prerequisites: Political Science 1 or 11 and sophomore standing.

273—Religicn in Afro-American Literature (3). (same as Religious Studies 273). Examination of Afro-American fiction, poetry and drama which present significant racial attitudes toward the Christian religion. Prerequisites: 131 or equivalent, sophomore standing.

275—Anthropology and the Concept of Race (3). (same as Anthropology 275). The concept of race is deconstructed by examining models of human origins, genetics and racist ideas about crime, intelligence and achievement. Paper and examinations required. Prerequisite: sophomore standing.

287A—Undergrad. Seminar in Black Studies: History of Race in the US (3). (same as History 287A). Readings on problems in American history with reports and discussion on selected topics. Prerequisite: junior standing, fifteen hours or consent of instructor. Departmental consent for repetition up to a maximum of 6 hours.

300—Special Problems (1-99). Independent investigation leading to a paper or a project. Prerequisite: junior standing, instructor's consent.

301—Undergraduate Topics in Black Studies (1-3). Organized study of selected topics. Subjects and credit may vary from semester to semester. Prerequisite: program consent for repetition. Prerequisite: junior standing.

304—Major African-American Writers (3). (Same as English 304.) An intensive study of selected African- American writers. Prerequisite: 204 or eqivalent. May be repeated to six hours with department's consent.

308A—Major African-American Women Writers (3). (Same as Women Studies and English 308A.) Study of a limited number (1-3) of significant African-American writers to be read intensively using contemporary feminist critical theory. Prerequisite: two courses in British or American Literature. Repeatable with department's consent. Maximum of six hours for 308 and 308A.

315—Themes in Literature by Women (3). (same as Women Studies 315). Examines works by a number of women writers with particular attention to their socio political context. May repeat to six hours with department's consent. Prerequisite: junior standing.

347—Working with Minority Youth (3). (same as Social Work 347). Develops awareness and understanding of social/psychological/ cognitive realities influencing the behavior of black youth. Content draws upon theories, research, and practice skills relevant to understanding black youth. Minority groups included. Prerequisite: instructor's consent.

348—Caribbean Women Writers (3). (same as Women Studies 348). Examines representative works by female authors from the Caribbean; primarily the English speaking islands. The depiction of Caribbean women will be a major consideration, as well as the unique qualities of Caribbean literature. Prerequisite: sophomore standing or instructor's consent.

351—The Black Family: Past, Present & Future (3). (same as Human Development and Family Studies 351). Emphasis is on the unique social, economic, religious, educational and political environments that have affected the structure and function of the black family. Prerequisite: junior standing. w.

354—Literature of the Black Diaspora (3). (Same as English 354.) An upper division course which explores other literatures written in English by and about people of African descent from South Africa, West Africa, the Caribbean, Central America, and Canada. Prerequisite: sophomore standing or above with backgrounds in Black history and/or literature.

371—Third World Politics (3). (same as Political Science 371).

373—Global Perspectives on Women and Development (3). (same as Sociology and Women Studies 373). Examines the history and structure of "development" discourse and practices. Stresses the interconnections and impact on women globally. Reviews women's strategies in defining and instituting programs to improve quality of life in communities. Prerequisites: Sociology 110, Women Studies 111, Black Studies, 111 or Women Studies 370.

377—Race, Gender and Ethnicity in Higher Education (3). (same as Higher & Adult Education K377 and Women Studies 377). Historical relationships of race, gender, and ethnic issues in United States higher education. Issues include: theory and research of curriculum and teaching, diversity within the the academy, and leadership, governance, and policy.

380—Social Work Practice With Minorities: African-American Emphasis (3). (same as Social Work 380). Provides students with an appreciation of the black experience in the United States on a knowledge and feeling level.

385A—Themes in African-American Folklore (3). (Same as Anthropology 384A and English 385A.) Intensive study in a selected area of African-American Folklore: folk narrative, folk song, myth, proverb, etc., folklore and literature, or the folklore of a partcular group. 385 and 385A may be repeated for a maximum of six hours with instructor's consent. Prereq-uisite: junior standing.

389—Economic Characteristics of the African American Experience (1). (same as History 389). Examines how economic considerations have influenced African American history from the trans- Atlantic slave trade to the present. Prerequisite: junior standing or instructor's consent. w,s.

391—African-Americans in the Twentieth Century (3). (Same as History 391.) Surveys the African-American experience from 1900 to the present. Attention is given to economic, political, social, and cultural trends.

400—Special Problems (1-99.9). Independent project or paper, not leading to dissertation. Pre- requisite: program's approval.

438—Readings in African-American History (3). (Same as History 438.) Readings on selected topics in African-American history from 1619 to the present, with emphasis on conflicting interpretations. May be repeated to a maximum of six hours.

439—Seminar in African-American History (3). (Same as History 439.) Directed research in selected topics in African-American history. May be repeated to a maximum of . six hours.

Business Administration

College of Business and Public Administration
303D Middlebush (573) 882-2750
Web Site: http://tiger.bpa.missouri.edu

FACULTY

Bruce J. Walker, dean, Lansford Professor of Leadership, PhD, University of Colorado.

Kenneth R. Evans, associate dean, professor of marketing, director of graduate studies in business, PhD, University of Colorado.

Albert R. Wildt, director of MBA program, Bailey K. Howard World Book Professor of Marketing, PhD, Purdue University.

Peter H. Bloch, professor of marketing, PhD, University of Texas.

Allen C. Bluedorn, professor of management, PhD, University of Iowa.

Thomas W. Dougherty, professor of management, PhD, University of Houston.

Ronald J. Ebert, professor of management, DBA, Indiana University.

Stephen P. Ferris, professor of finance, chair, PhD, University of Pittsburgh.

Lori S. Franz, professor of management, PhD, University of Nebraska.

Daniel W. Greening, associate professor of management, PhD, The Pennsylvania State University.

John S. Howe, professor of finance, PhD, Purdue University.

Arthur G. Jago, professor of management, chair, PhD, Yale University.

Richard A. Johnson, associate professor of management, PhD, Texas A&M University.

Thomas W. Miller Jr., associate professor of finance, PhD, University of Washington.

Richard H. Pettway, Missouri Bankers Chair professor of Finance, director of Financial Research Institute, PhD, University of Texas.

Marsha L. Richins, professor of marketing, PhD, University of Texas.

John D. Stowe, professor of finance, PhD, University of Houston.

William B. Wagner, professor of marketing, PhD, The Ohio State University.

James A. Wall Jr., professor of management, PhD, University of North Carolina.

David A. West, professor of finance, PhD, University of Arkansas.

Charles J. Corrado, associate professor of finance, PhD, State University of New York-Albany and PhD, University of Arizona.

Charles R. Franz, associate professor of management, PhD, University of Nebraska.

Lisa K. Scheer, associate professor of marketing, PhD, Northwestern University.

Daniel B. Turban, associate professor of management, PhD, University of Houston.

Christopher W. Anderson, assistant professor of finance, PhD, University of Pittsburgh.

Srinath Gopalakrishna, assistant professor of marketing, PhD, Purdue University.

Cynthia G. McDonald, assistant professor of finance, PhD, University of South Carolina.

Douglas D. Moesel, assistant professor of management, PhD, Texas A&M University.

Clifford P. Stephens, assistant professor of finance, PhD, University of Arizona.

Shaoming Zou, assistant professor of marketing, PhD, Michigan State University.

DEGREES: MBA and PhD in business administration

COOPERATIVE DUAL DEGREES: MBA and MHA, MBA and MS in industrial engineering, MBA and JD

The master of business administration and the doctor of philosophy in business administration are offered by the School of Business and the College of Business and Public Administration through the departments of Finance, Management and Marketing. The School of Business faculty is housed in Middlebush Hall. Besides an auditorium, classrooms and office space, Middlebush Hall also houses three computer labs containing networked microcomputers. On-

line database access available to students includes the BRIDGE System for real-time stock market data, Lexis/Nexis, Dow Jones News Retrieval, ABI-Inform, Compact Disclosure SEC and Worldscope, and Compustat PC+. The B&PA Research Center and the Multimedia Development Center also provide computer support services to business and public agencies in the State of Missouri and to MU faculty and students. Of particular interest to graduate students are the support services and databases related to business and economic conditions, COMPUSTAT, Census CRSP, FDIC and Citibank files and the assistance with web and computer technology.

The MBA degree is designed for highly capable graduate students whose primary interest is preparation for managerial careers in business. It also provides a strong educational background for people who plan to continue their academic training in preparation for teaching and research in business administration. Although major emphasis is placed on all business functions, the program provides for a concentration in one area of work.

The program is open to applicants who hold a baccalaureate degree in any discipline from an accredited school. Both undergraduate GPA and performance on the Graduate Management Admissions Test (GMAT) are important factors considered in acceptance. An international student whose native language is not English is required to present a minimum score of 550 on the Test of English as a Foreign Language (TOEFL) and at least the 40th percentile on the verbal portion of the GMAT. Both the GMAT and TOEFL are administered by the Educational Testing Service.

Students are required to have completed appropriate prerequisite courses or their equivalent in business calculus, basic and intermediate statistics, and microeconomic theory before or concurrent with enrollment in first semester courses. Foundation courses may be waived if students have equivalent prior course work.

Total graduate course work necessary to qualify for the MBA degree may vary from 33 to 55 semester hours (assuming completion of prerequisite course work prior to entering the program). Individual program length depends on the number of foundation courses a student waives.

Foundation courses total 25 hours of work in the following subjects: accounting, communications, computer application, business law and regulation, organizational ethics, micro-macro economics, operations management, finance and marketing.

To ensure depth in each of the functional areas of business, an upper-level course in each of the areas of finance, management, marketing and business policy is required. Enrollment in the MBA Seminar is required each semester for a maximum of three semesters. All students also participate in a team case study project and an MBA team consulting project that provide a real-world, problem-solving field experience. The remainder of the course work is composed of a nine-hour emphasis area and six hours of electives. The structure of the MU MBA allows students to concentrate in a specific area of business, develop a broad managerial focus, or complement business training with strength from other areas on campus.

Not more than six hours of advanced work may be transferred from another university and that university must be accredited at the master's level by the American Assembly of Collegiate Schools of Business.

Financial assistance from research and teaching assistantships is available and is awarded on a competitive basis. These assistantships are usually quarter-time appointments involving 10 hours of work a week at approximately $4,000 annually. All or some educational fees may be waived for holders of assistantships.

Applications and additional information about the program may be obtained by writing the Director of Graduate Studies in Business, 303D Middlebush Hall, Columbia, MO 65211, or by e-mail at grad@bpa.missouri.edu.

The PhD program is designed to prepare graduates for careers as effective university researchers and teachers or for senior research positions in business or government. A primary objective of the program is to train PhD candidates to become proficient researchers. Therefore, course work involves research activities such as literature review and critique, theoretical modeling, research design, computer-assisted empirical analysis, and preparation of proposals and research papers. Another objective is to train students to become high-quality teachers. PhD candidates are provided the opportunity to teach undergraduate courses in their specialty area. In addition, students are expected to participate in national and regional academic conferences and are encouraged to work with faculty in developing individual research and teaching skills.

The PhD program is open to applicants who have exhibited outstanding performance in previous academic work, have superior test scores from the GMAT, and display the maturity and potential required for making scholarly contributions to their field of interest. To apply for permission to begin course work leading to the PhD degree, applicants must submit the following: transcripts from all colleges and universities attended; a score from the GMAT; a score from the TOEFL, if an international student; three letters of recommendation from people who can attest to the student's abilities; and a statement by the applicants indicating the intended major area of study, career objectives, and any other information deemed pertinent for consideration by the admissions committee.

During the first semester of course work, the PhD Coordinator, a member of the doctoral faculty from the major area of study (finance, management or marketing), serves as the student's faculty adviser. By the end of the first year of course work, a student should apply for the doctorate degree and, after consultation with faculty, request appointment of a Doctoral Program Committee. This five-member committee consists of at least three members from the student's major area of study and at least one member from the supporting area(s) of study. The Doctoral Program Committee conducts the qualifying examination and works with the student to design a program of study that must include the following:

- Fifteen hours of business core course work to acquaint the student with the functional areas of business. These courses can be waived if the student has satisfactorily completed equivalent course work.
- An in-depth major concentration in the area of finance, management or marketing (minimum of 15 hours of 400-level courses).
- Two support areas of at least nine hours each, one of which must be taken outside the School of Business, or one support area of at least 12 hours. These supporting areas offer the student considerable latitude in identifying a course of study that can be tailored to the individual's interests and goals.
- Collateral requirements emphasizing analytical tools (proficiency in a foreign language does not fulfill the collateral requirements). This is a research methods and analyses sequence of at least 12 hours (at least 18 if only one support area), including appropriate courses in economics, mathematics, psychology, sociology, statistics or other areas deemed appropriate by the program committee.
- An ongoing seminar experience (each semester before taking the comprehensive examinations) that acquaints the student with current literature and research in his/her major area of interest. This seminar is in addition to other seminars offered departmentally (four hours minimum).
- Dissertation (minimum 12 hours of 490 credit).

The program of study requirements listed above are independent of each other; courses taken to satisfy one requirement may not be used to satisfy any other requirement. Previous graduate work taken before admission to the PhD program may be used to satisfy these requirements if it is deemed appropriate by the student's program committee. In compliance with University regulations, the doctor of philosophy degree requires the completion of 72 semester hours of graduate work beyond the baccalaureate degree. Within the credit-hour requirement is the residency requirement. To satisfy the residency requirement, a student must complete at least two nine-hour semesters or three six-hour semesters in an 18-month period at MU. All courses taken to satisfy the residency requirement must be MU courses approved for graduate credit and approved by the student's doctoral program committee. Correspondence and off-campus courses may not be counted toward the residency requirement. This program is designed for full-time students and typically requires a four-year on-campus commitment.

Financial assistance (research and teaching assistantships) is generally awarded at the time of acceptance to the program. These assistantships are usually half-time appointments involving approximately 20 hours of work each week with work split between teaching and research assignments. Assistantships are supplemented by scholarships to provide a $11,000-$14,000 minimum annual stipend. Educational fees are waived for holders of assistantships.

Applications and additional information about the doctoral program may be obtained by writing the Director of Graduate Studies in Business, 303D Middlebush Hall, Columbia, MO 65211, or by e-mail at grad@bpa.missouri.edu.

COURSES

Note: Course descriptions for other required or elective courses may be found in the Finance, Management, Marketing and other departmental sections of this catalog.

324—Managerial Statistics (3). Statistics as an aid in decision making; emphasis on statistical inference, sampling techniques, and nonparametric statistics as applied to problems of business and public administration.

326—Managerial Decision Science (3). Describes the application of management science modeling procedures to organizational decision making. Topics include mathematical programming, queuing, simulation, network models and decision theory. Stresses manager's point of view with emphasis on analysis of problems and interpretation of computer solutions. Prerequisites: 320.

344—Managerial Finance (3). Analyzes financial information relative to acquisition, management of assets; costs of alternative financial contracts; effect of mix of outstanding securities on entity's cost of capital; interaction between funding/investment decisions. Prerequisites: 310 or departmental consent.

346—Managerial Marketing (3). Analysis and control of an integrated marketing program with special emphasis on prices, products, promotion, and channels of distribution.

350—MBA Communications Practice (1-3). Special laboratory instruction in oral and written communication skills with an emphasis on business. communications. Prerequisites: graduate standing.

400—MBA Seminar (1-3). Integration of business executives and real world problem solving, career preparation, and professional growth activities. Assignments emphasize teamwork and group productivity. Prerequisites: MBA students only. May be repeated.

401—Topics Business Administration (1-99). Selected topics in administration offered on experimental basis. Prerequisites: graduate standing and instructor's consent.

405—Team Case Project (1-3). Application of functional areas of business to real-world cases in business planning. Students will prepare and present business plan for an organization as a team project in a supervised experience. Prerequisite: graduate standing.

410—MBA Consulting Project (2-3). Group consulting project focused on a real-world problem environment. Supervised field experience in a approved organizational setting. Prerequisite: graduate standing.

442—Business and Society (3). Interdependence of the business firm and its social, political, and legal environment; interrelationships with governments, interest groups, and the larger society; role of business in formulation of community, regional, national, and foreign policy.

449—Business Environment and Policy (3). Investigates alternative goals of business enterprises relative to internal resources and external environment; development and implementation of policies and strategies to achieve objectives. Cases, computer simulations, and/or field research may supplement published materials.

481—Research Design and Methodology (3). Intensive study of fundamental issues, problems, and procedures in the conduct of research in business organizations. Orientation includes philosophical, theoretical, empirical, and operational considerations. Prerequisites: Ph.D. standing or instructor's consent.

Chemical Engineering

College of Engineering
W2030 Engineering Building East (573) 882-3563

FACULTY

Sunggyu Lee, chair, C.W. LaPierre professor, PhD, Case Western Reserve University. Polymer processing, polymer blends, supercritical fluid technology, C_1-chemistry, catalysis, reaction process engineering.

David G. Retzloff, associate chair and director of graduate studies, associate professor, PhD, University of Pittsburgh. Mathematical analysis and modelling of chemical processes.

Paul C. H. Chan, director of undergraduate studies, associate professor, PhD, California Institute of Technology. Chemical reactor and process dynamics.

Rakesh K. Bajpai, professor, PhD, Indian Institute of Technology-Kanpur. Transport processes in biosystems and in bioreactors, growth and product formation kinetics, fate of contaminants in environment, bioremediation of contaminated sites, downstream processing.

Richard H. Luecke, professor, PhD, University of Oklahoma. Process control and optimization, process analysis and modeling, modeling of biological systems.

Truman S. Storvick, professor emeritus, PhD, Purdue University. Thermodynamic and transport properties of fluids, electrochemical separations — molten salts and liquid metal systems.

Dabir S. Viswanath, Dowell professor, PhD, University of Rochester. Kinetics of thermal degradation of polymers and effect of ceramic surfaces, thermophysics of ceramics and ceramic laminates, heterogeneous catalysis, partial and oxidative coupling of methane.

H. K. Yasuda, Dowell professor, director, Surface Science and Plasma Technology Center, PhD, SUNY, College of Environmental Science and Forestry, Syracuse University.

Thomas R. Marrero, associate professor, associate director of the Capsule Pipeline Research Center, PhD, University of Maryland. Coal log transport, mass transport.

Patricia A. Darcy, assistant professor, PhD, University of Iowa. Biochemical engineering, bioprocesses and bioengineering.

William A. Jacoby, assistant prefessor, PhD, Colorado. Environmental processing, bioremediation.

Stephen J. Lombardo, assistant professor, PhD, Berkeley. Ceramic materials, ceramic processing.

DEGREES: MS and PhD in chemical engineering

The Department of Chemical Engineering offers graduate work leading to the degrees of master of science and doctor of philosophy. Information on engineering licensure is detailed under **Professional Engineering Registration.** Currently active research areas include polymer processing, plasma technology, supercritical fluid technology, alternative fuels, environmental catalysis, ceramic materials, process control and dynamics, biotechnology, clean process technology, bioremediation, blends and composites, catalysis and C_1-chemistry, mathematical modeling and simulation, and biochemical engineering.

There are excellent facilities for research students, including an equation of state and transport properties laboratory; a heterogeneous catalysis and reaction kinetics laboratory; a heat and mass transport laboratory; an air pollution monitoring and control laboratory; a biochemical engineering laboratory; a computational laboratory; and a transport properties phenomena laboratory. Excellent library facilities provide the latest domestic and international journals specific to chemical engineering and physical sciences research.

Research and teaching assistantships are available to qualified students for the academic year. The stipend for a half-time appointment ranges from $10,000 to $12,600 and waives the educational fee.

Half-time appointments allow 12 credit hours of advanced study each semester. Academically qualified students may receive additional scholarship awards. Grant research assistantships and some industrial and Graduate School fellowships also are available. The applicant's academic record and research potential determine the financial assistance offered. Financial assistance for students who wish to continue their study during the summer session is usually available. This assistance amounts to approximately 20 percent of the stipend for the academic year and often there is full-time support for the two-month summer session.

MASTER'S DEGREE: To be accepted for advisement, a student must have completed a chemical engineering undergraduate curriculum or its substantial equivalent, at a school accredited by the Accreditation Board for Engineering and Technology, and must hold a BS degree in chemical engineering. Graduates holding degrees in physics, chemistry, applied mathematics and related fields also may be considered for candidacy, but are required to take additional course work.

To be accepted for advisement in the chemical engineering graduate program, applicants should meet requirements for admission to the Graduate School and have a minimum of 3.0 overall GPA (A=4.0) in undergraduate work. Consideration is given to grade trends, performance in the area of chemical engineering and mathematics and other criteria bearing on a student's probable success in graduate study. Selected students with less than a 3.0 overall GPA may be considered on a probationary basis. Financial support is competitive and requires a 3.0 GPA.

The GRE is required. Test scores should be submitted to the Graduate School, 210 Jesse Hall, Columbia, MO 65211.

An individual program of a minimum of 30 semester hours is required and includes seminars, advanced courses in chemical engineering, physical and chemical sciences, mathematics and not more than nine hours of research or other unscheduled work. No foreign language or collateral field is required. A thesis is required. A candidate completes the master's program by passing an examination in defense of the thesis.

DOCTORAL DEGREE: An applicant for the PhD program must take a qualifying examination and a comprehensive examination. Twenty-one semester hours of course work beyond the MS degree is required.

Before being admitted to candidacy and proceeding to prepare a dissertation, the student must pass a comprehensive examination.

The exam involves a project to be completed within a 30-day period, requiring original and

creative work in delineating a research problem of some substance.

A dissertation is required of all candidates. A final oral examination is held when the candidate defends the dissertation.

COURSES

225—Chemical Process Calculations (3). Industrial stoichiometry, material and energy balances, thermophysics, thermochemistry; related topics. Prerequisites: Physics 175, Chemistry 210, or concurrently.

234—Principles of Chemical Engineering I (3). Fluid flow, heat transfer. Prerequisites: 2.0 or better in 225.

235—Principles of Chemical Engineering II (3). Mass transfer. Prerequisite: 234.

243—Chemical Engineering Laboratory I (3). Laboratory study of some principal unit operations of chemical engineering. Prerequisite: 235 or concurrently.

261—Chemical Engineering Thermodynamics I (3). Study of thermodynamics, with particular reference to chemical engineering applications. Prerequisites: 2.0 or better in 225.

262—Chemical Engineering Thermodynamics II (3). Prerequisite: 261.

300—Problems (2-4). Directed study of chemical engineering problems. Prerequisite: instructor's consent.

301—Topics in Chemical Engineering (3). Current and new technical developments in chemical engineering. Prerequisite: instructor's consent.

304—Digital Computer Applications in Engineering (3). (same as Electrical Engineering 304, Mechanical and Aerospace Engineering 304). Use of digital computer for solution of engineering problems involving roots of equations, simultaneous equations, curve fitting, integration, differentiation and differential equations. Prerequisite: Mathematics 201.

306—Advanced Engineering Math (3). (same as Nuclear Engineering 306). Applies ordinary and partial differential equations to engineering problems; fourier's series; determinants and matrices; Laplace transforms; analog computer techniques. Prerequisite: Mathematics 304.

311—Chemodynamics (3). Environmental movement of chemicals in air, water, and soil; designed to introduce students to the basic principles and techniques useful for the prediction of the movement and fate chemicals in ecosystems. Prerequisites: 234 or instructor's consent.

312—Air Pollution Control (3). Modeling of urban air pollution and control techniques. Topics treated are plume dispersion theories, photochemistry, methods of monitoring, methods of industrial abatement and legal aspects. Prerequisites: 311 or instructor's consent.

314—Biochemical Engineering Operation (3). Transport processes in bioreactors, agitation and aeration, scale-up, sterilization, liquid-solid separation, cell distegration, and other units operations related to product recovery.

315—Introduction to Biochemical Engineering (3). General introduction to biochemical engineering follows fundamentals of microbiology and biochemistry. Topics: fermentation, microbial population kinetics, bioproduct separation and purification, enzyme engineering techniques, biochemical reaction energetics. Prerequisites: Chemistry 212, Mathematics 201 or instructor's consent.

317—Chemical Processing in Semiconductor Device (3). This course covers the current plasma processing methods used to produce semiconductor devices with emphasis on memory devices. The physics and chemistry of how plasmas are formed, sustained and interact with the semiconductor wafers being processed. Plasma chemistry and the chemical reactions used in plasma etching are discussed.

319—Introduction to Polymer Materials (3). An introduction to the structure and properties of polymers. Solution properties, molecular weight determination and rheological behavior are studied. Manufacturing and processing techniques are considered. Prerequisites: 262 & Chemistry 212. w.

335—Transport Phenomena (3). Integrated study of momentum, heat and mass transport. Prerequisites: 235, 262, 304 and Mathematics 304.

345—Special Reading (2-5). Individually supervised special reading leading to an engineering report. Prerequisite: senior standing.

349—Hazardous Waste Management (3). Engineering principles involved in handling, collection transportation, processing and disposal of hazardous waste minimization, legislation on hazardous wastes and groundwater contamination. Prerequisite: junior standing.

350—Research for Honor Students (3-6). Individual research for a senior thesis; research is supervised by the chemical engineering faculty. The thesis is to be defended before the departmental Honors committee. Prerequisite: senior standing.

363—Chemical Reaction Engineering and Technology (3). Reactor design and optimization; rate equations; thermal effects in reactor. Prerequisites: senior standing in Chemical Engineering, 262, 304, or instructor's consent.

370—Modern Methods of Chemical Process Control (3). Process description using state space theory; introduction to digital control techniques; stability analysis. Prerequisites: senior standing in Chemical Engineering and 262,304 or instructor's consent.

379—Particulate Systems Engineering (3). An introduction to natural and engineered particulate systems. Prerequisites: Mechanical and Aerospace Engineering 299 or equivalent.

385—Chemical Engineering Design I (4). The course presents optimum design methods, cost estimation, material selection and other relevant areas for the design of chemical plants. In addition, chemical safety, risk assessment and introduction to reliefs will be covered. Prerequisite: senior standing 235, 262 and 304.

387—Process Synthesis and Design (3). Mathematical analysis and modeling of chemical processes; optimization during process design and operation. Prerequisite: 304

400—Problems (1-5). Supervised investigation in chemical engineering to be presented in the form of a report. Prerequisite: instructor's consent.

401—Advanced Topics in Chemical Engineering (3). Prerequisite: instructor's consent.

408—State Variable Methods in Automatic Control (3). (same as Mechanical and Aerospace Engineering 408, Electrical Engineering 408, Nuclear Engineering 408). State variables for continuous and discrete-time dynamic control systems; controllability and observability; optimal control of linear systems. Prerequisites: 370, Electrical Engineering 206, Mechanical & Aerospace Engineering 357 or instructor's consent.

410—Seminar (1). Reviews investigations and projects of importance in chemical engineering.

419—Plasma Polymerization (3). Fundamental aspects of polymer formation in plasma state: gas ionization, reaction kinetics, plasma characteristics and operational parameters of plasma reactors. Properties of plasma - synthesized ultrathin films and their utilization also discussed. Prerequisites: 319 or instructor's consent.

420—Advanced Heat and Momentum Transfer (3). Advanced study of these transport phenomena. Prerequisites: 235, 335.

422—Analysis of Equilibrium Stage Processes (3). Advanced study of stage processes. Prerequisites: 235, 262 and 304.

423—Advanced Mass Transfer (3). Advanced study of mass transfer. Prerequisite: 420 or consent of instructor.

429—Membranes and Membrane Processes (3). Thermodynamics and mass transfer of membrane separation processes; Concentration-Driven Processes; Pressure-Driven Processes; Electromembrane Processes; Biological Membrane Processes; Membrane Polymers; Preparation of Membranes; Membrane Separation Application (potable and ultrapure water, effluent treatment, gas separations, electrochemistry, dialysis therapeutic, and other applications).

449—Advanced Hazardous Waste Treatment Processes (3). (same as Civil Engineering 449). Course includes some introductory materials about hazardous waste regulations followed by advanced treatment methods such as air stripping, soil-vapor extraction, chemical oxidation, membrane processes, in-situ and ex-situ biotreatment methods, solidification and thermal processes. Prerequisite: CE 349.

451—Advanced Chemical Engineering Thermodynamics I (3). Advanced thermodynamics; particular reference to its application to chemical engineering. Prerequisite: 262.

452—Advanced Chemical Engineering Thermodynamics II (3). Prerequisite: 451.

463—Chemical Reaction Engineering Science (3). Phenomenological behavior of catalysts. Theoretical interpretations for heterogeneous and homogeneous catalysts. Prerequisite: 363.

470—Mathematical Studies of Chemical Engineering Operation (3). Analytical methods applied to solution of chemical engineering problems. Prerequisite: Mathematics 304.

471—Process Optimization Methods in Chemical Engineering (3). Steady-state and unsteady-state optimization techniques applied to chemical processes. Prerequisite: 304.

472—Advanced Computing for Chemical Engineers (3). Interactive computing; advanced languages and programming techniques; process simulation; stiff dynamical systems; regression analysis; process optimization. Prerequisite: 304.

490—Research (1-99.9). Independent investigation in chemical engineering, to be presented as a thesis. Graded on a S/U basis only.

Chemistry

College of Arts and Science
125 Chemistry Building (573) 882-8374
Fax: [573] 882=2754

FACULTY

Jerry L. Atwood, chair, Curator's Professor, PhD, University of Illinois at Urbana-Champaign.

Richard C. Thompson, associate chair for graduate studies, professor, PhD, University of Maryland.

John E. Adams, associate chair for undergraduate studies, associate professor, PhD, University of California-Berkeley.

John E. Bauman Jr., professor emeritus, PhD, University of Michigan.

Michael Harmata, professor, PhD, University of Illinois at Urbana-Champaign.

Edwin M. Kaiser, Curators' Teaching Professor, PhD, Purdue University.

S. Roy Koirtyohann, professor emeritus, PhD, University of Missouri-Columbia.

Robert R. Kuntz, professor, PhD, Carnegie Institute of Technology.

Richard N. Loeppky, Schlundt professor, PhD, University of Michigan.

Stanley E. Manahan, professor, PhD, University of Kansas.

John P. McCormick, professor, PhD, Stanford University.

R. Kent Murmann, professor emeritus, PhD, Northwestern University.

Patricia L. Plummer, professor, PhD, University

of Texas-Austin.
Norman Rabjohn, professor emeritus, PhD, University of Illinois.
Scott Searles, Jr., professor emeritus, PhD, University of Minnesota.
Paul R. Sharp, professor, PhD, Massachusetts Institute of Technology.
Wynn A. Volkert, professor, PhD, University of Missouri-Columbia.
Tuck C. Wong, professor, PhD, University of Michigan.
Kent S. Gates, associate professor, PhD, Northwestern University.
Rainer Glaser, associate professor, PhD, University of California-Berkeley.
C. Michael Greenlief, associate professor, PhD, University of Texas-Austin.
Robert E. Harris, associate professor, PhD, University of California-Berkeley.
Silvia Jurisson, associate professor, PhD, University of Cincinnati.
John F. Kauffman, associate professor, PhD, University of Illinois at Urbana-Champaign.
Jerome O'Laughlin, associate professor emeritus, PhD, Iowa State University.
Lesa J. Beamer, assistant professor, PhD, Johns Hopkins University.
Steven W. Keller, assistant professor, PhD, University of California-Berkeley.
Shon R. Pulley, assistant professor, PhD, Colorado State University.
Donald E. Riederer, Jr., assistant professor, PhD, Purdue University.
John J. Tanner, assistant professor, PhD, Brown University.
Sheryl A. Tucker, assistant professor, PhD, University of North Texas.
Gary J. Ehrhardt, adjunct professor, PhD, Washington University.
Alan R. Ketring, adjunct professor, PhD, University of Missouri-Columbia.
J. Steven Morris, adjunct professor, PhD, University of Missouri-Columbia.
Jim Petty, adjunct professor, PhD, University of Missouri-Columbia.
Fred K. Ross, adjunct professor, PhD, University of Illinois at Urbana-Champaign.
Kattesh V. Katti, adjunct associate professor, PhD, Indian Institute of Science.

DEGREES: MS and PhD in chemistry

The department offers areas of concentration in analytical, inorganic, organic, physical and radiochemistry, as well as interdisciplinary programs with the biological, environmental, medicinal and other physical sciences. Well-equipped research laboratories and facilities that contain standard and specialized equipment for research are maintained in these areas. An NMR center, X-ray diffraction lab, laser Raman spectrometer, mass spectrometers, GC-FTIR spectrometer and nuclear/radiochemistry lab are in the Chemistry Complex. The department maintains additional radiochemical research labs at the University of Missouri Research Reactor Center (MURR), Truman Veterans Hospital and the Center for Radiological Research (CRR). Other campus facilities widely used by the department include a central instrument shop, glass blowing shop, electronics shop, campus computing center and a 10-megawatt nuclear reactor. The latter provides a high neutron flux for radioisotope production, neutron activation analysis and neutron diffraction studies.

Fellowships, teaching and research assistantships are available for highly qualified applicants. Application forms, which may be obtained from the department office, should be submitted by February 14.

GRADUATE DEGREE REQUIREMENTS: An applicant for graduate work in chemistry should have either a bachelor of arts or bachelor of science degree in chemistry, essentially equivalent to those awarded at MU, with a B average or a score at the 70th percentile on the GRE general test.

All new graduate students in chemistry are required to take departmental placement examinations shortly before registration. These examinations also serve as qualifying examinations. A student who performs well, as determined by the departmental graduate committee, on any of the four divisional examinations will be considered to have qualified in that division. Students who do not qualify in particular areas on the placement examinations must pass an appropriate advanced-level course in those areas to qualify. An A or B grade is required in these courses for PhD qualification. In addition, PhD students must take at least two 400-level courses outside their own area. Courses at the 300-level in departments other than chemistry also may satisfy this requirement.

Students are expected to select a research adviser by the early part of the second semester. The departmental graduate committee meets with the student and the adviser toward the end of the second semester to review progress in course work and the start of research work.

THE MASTER'S DEGREE program requires a minimum of 30 hours of graduate-level course work, including 8 to 12 credit hours of research, satisfactory completion of the qualifying examinations and an acceptable thesis. A final oral examination covering the thesis and course work is given before the degree is awarded.

DOCTORAL DEGREE: Cumulative exams are given monthly. All students next write a research proposal on a topic approved by their committee. The proposal is defended before the committee as the oral comprehensive exam. This exam stresses the major field but may include questions from related areas of chemistry. The candidate must submit and defend a dissertation describing the results of successful and original research in one of the branches of chemistry.

COURSES

205—Introduction to Organic Chemistry (5). A survey of organic chemistry, including an introduction to structure and bonding, functional group chemistry, principles of reactivity, reaction mechanisms, the molecules of life. Laboratory illustrates and augments the lecture material. 4 lectures, 1 lab per week. Prerequisite: grade of C or better in 32 or equivalent.
210—Organic Chemistry I (3). First course of a two-semester sequence. Topics include structure and bonding, chemistry of hydrocarbons, alkyl halides, alcohols and ethers, reaction mechanisms, principles of reactivity and synthesis, IR and NMR spectroscopy. Only 1 credit hour if taken after 205 or equivalent. Prerequisite: grade of C or better in 32 or equivalent.
212—Organic Chemistry II (5). Continuation of 210; includes laboratory. An emphasis on carbonyl compounds, amines, multifunctional compounds including the molecules of life, reaction mechanisms, synthesis and spectroscopic characterization; introduction to organic chemistry laboratory techniques, practicalities of compound synthesis, separation, and characterization. Prerequisite: grade of C or better in 210 or equivalent.
213—Organic Chemistry Laboratory (2). Preparation and identification of organic compounds; application of instrumental techniques. 2 lab sessions, 1 discussion session per week. Prerequisite: grade of C or better in 212 or equivalent.
216—Honors Organic Chemistry I (4). First course of a two-semester sequence. Similar to 210 but with increased depth and breadth; emphasis on preparing science students for research and professional careers. 3 lectures, 1 discussion session per week. Prerequisite: honors eligibility, grade of B or better in 32 or equivalent.
217—Honors Organic Chemistry II (5). Continuation of 216; includes laboratory. Content and structure similar to 212, but with increased depth and breadth. Prerequisites: honors eligibility, grade of B or better in 216 or instructor's permission.
218—Honors Organic Chemistry Laboratory (2). Preparation and identification of organic compounds; multistep syntheses; application of instrumental techniques, including NMR, FTIR, MS and HPLC. 2 lab sessions, 1 discussion session per week. Prerequisites: honors eligibility, grade of C or better in 217 or equivalent.
221—Quantitative Methods of Analysis (4). Principles and practice of quantitative analysis, including the basic principles of modern instrumental methods. Prerequisite: 33.
223—Quantitative Chemical Analysis (3). Formal presentation of the principles and practice of quantitative analysis, including elementary instrumental methods. Prerequisites: 33, 133. f,w.
230—Fundamentals of Physical Chemistry (3). Survey of physical chemistry for students not intending to pursue advanced work in chemistry. Satisfies physical chemistry prerequisite for Biochemistry 372. Prerequisite: Math 175, a course in organic chemistry; Physics 21 and 22 or Physics 175, or 176 concurrently. f.
231—Physical Chemistry (3). Lecture only. Topics include the kinetic theory of gases, chemical kinetics, thermodynamics and chemical equilibrium. Prerequisites: one semester organic chemistry and one year University Physics and Mathematics 201, or Mathematics 201 concurrently. f.
233—Physical Chemistry (3). Continuation of 231. Lecture only. Covers wave mechanics, bonding, molecular spectroscopy and statistical mechanics. w.
234—Physical Chemistry Laboratory (3). Normally concurrent with 233. Prerequisites: 221 or 223 with a C or better. w.
250—Senior Research (3). A laboratory research project with approved written goals and a final written report. It may be taken twice. Prerequisites: a 2.75 GPA, 33 hours of chemistry or senior standing, and consent of Director of Undergraduate Studies. f,w,s.
270—Undergraduate Seminar in Chemistry (3). Methods for locating and presenting chemical information, data analysis techniques, professional issues. Prerequisites: 33, 210.
280—Internship in Chemistry (1-6). Cannot be substituted for other chemistry courses required for B.S. or A.B. degree. Prerequisites: 2.75 GPA, 20 hours of Chemistry, departmental consent of the Director of Undergraduate Studies. S/U graded only.
298—Senior Honors Research (3). A laboratory research experience with a student-instructor prepared outline approved by the Honors Director, a final written report and a final oral presentation and examination. Prerequisites: a 3.33 GPA, senior standing, instructor's approval and approval of project outline. f,w,s.

299—Senior Honors Research (3). A laboratory research experience with a student-instructor prepared outline approved by the Honors Director, a final written report and a final oral presentation and examination. Prerequisites: a 3.33 GPA, senior standing, instructor's approval and approval of project outline. f,w,s.

300—Problems in Chemistry (1-99). Individual study under the direction of a faculty member that supplements regular course work. Prerequisite: upper-class standing and instructor's consent. f,w,s.

301—Topics in Chemistry (1-99). Organized study designed to broaden knowledge base of new graduate students. Subjects on analytical, inorganic, organic and physical chemistry covered. Prerequisite: departmental consent for repetition. f,w.

305—Advanced Chemistry Laboratory (3). Advanced methods for the synthesis and characterization of organic, inorganic, and organometallic compounds. Prerequisite: 141, 212, 223, 233 (233 may be taken as a corequisite).

312—Instrumental Methods of Analysis (3). Chemical instrumentation methods including electrochemistry, spectroscopy, and advanced separations techniques. Prerequisites: 223, semester of physical chemistry. f.

316—Synthetic Organic Chemistry (3). Stresses synthetic organic chemistry at an intermediate level. Prerequisite: at least one year organic chemistry.

317—Medicinal Chemistry (3). Chemical mechanisms of drug action. Topics include drug metabolism and action, chemical toxicology and medicines, enzyme activity, and specific drug case studies. Prerequisite: 212, 230 or 231 or instructor's consent.

325—Chemical Instrumentation for Secondary Science Teachers (3). Fundamental concepts, development and design of experiments in chemical instrumentation including spectroscopy development and chromatography for secondary science teachers. Prerequisite: one year of general chemistry, one year of organic chemistry, and one year of college physics; instructor's consent required. May be repeated for credit up to a maximum of 6 hours. s.

329—Environmental Chemistry (3). Surveys the chemistry of air and water environments; discusses the chemistry of waste treatment. May not be used to satisfy the advanced chemistry course requirement on the B.S. degree Prerequisite: 8 hours chemistry including organic & analytical.

331—Intermediate Physical Chemistry I (3). Treatment of thermodynamics, chemical equilibrium, kinetic theory of gases and chemical kinetics designed to provide a broad base of knowledge in these fundamental areas to beginning graduate students in chemistry. Prerequisite: departmental consent.

333—Intermediate Physical Chemistry II (3). Treatment of atomic and molecular, structure and spectroscopy based on quantum concepts. Designed to provide a broad base of knowledge in these fundamental areas to beginning graduate students in chemistry. Prerequisite: departmental consent.

341—Inorganic Chemistry (3). Atomic and molecular structure, bonding, kinetics and mechanism, ligand field theory, coordination compounds, acids and bases. Prerequisite: one semester Physical Chemistry, 2nd semester co-requisite. w.

351—Topics in Environmental-Toxicological Chemistry (3). In-depth study of the chemical aspects of current issues dealing with environmental pollutants and toxic chemical substances. Prerequisite: 329 or equivalent.

361—Introduction to Radiochemistry (3). Introduces application of radio-tracer techniques to chemical research. Prerequisite: 33, course in quantitative analysis, and one semester of physical chemistry, or instructor's consent. w.

401—Topics (1-99). Organized study of selected topics. Subjects and earned credit may vary from semester to semester. Repeatable upon consent of department. Prerequisite: instructor's consent.

402—Introduction to X-ray Crystallography (3). Designed for students in chemistry and related fields. Aimed at offering a practical understanding of single-crystal x-ray structural studies. Includes hands-on laboratory work (data collection and analysis). Prerequisites: prior approval of the instructor.

410—Seminar (1). f,w.

411—Organometallics (3). Condensations effected by organometallics; dissolving metal reductions; sandwich compounds and related organotransition metal derivatives.

412—Physical Organic Chemistry I (3). Bond theory, physical methods, absorption spectroscopy, conformational analysis, mechanism of reactions.

415—Organic Reaction Mechanisms (3). Organic reaction mechanisms are discussed within a framework of structure-reactivity relationships. Particular attention directed to the chemistry of reactive intermediates and the application of stereochemical and molecular orbital concepts. Prerequisites: 1 year of Organic Chemistry and Physical Chemistry.

416—Organic Spectroscopy (3). Structural analysis of organic compounds involving problem solving using modern MNR, IR, UV-VIS, MS CD/ORD and other spectroscopic techniques. Prerequisites: 233 or instructor's consent.

417—Applications of the Reactions of Organic Chemistry (3). Prerequisite: one year graduate Organic Chemistry.

419—Physical Organic Chemistry II (3). Case studies and methods for determining organic reaction mechanizing.

421—Analytical Measurement (3). Fundamental and applied aspects of scientific measurements. Topics include: Statistics, signal-to-noise, frequency analysis, sources of noise, digital and analog filtering, time vs frequency domain measurements, Fourier transformation, sampling, convolution/deconvolution, autocorrelation and cross-correlation. Directed toward entering graduate students. f.

423—Separations and Chromatography (3). Classical and instrumental methods of separation: gas, paper, thin film, and column chromatography; ion exchange.

425—Analytical Spectroscopy (3). Selected topics dealing with recent advances in analytical chemistry.

427—Advanced Analytical Chemistry (3). Continuation of 425.

429—Environmental and Xenobiotics Analysis (3). Covers standard (reference) and emerging methods of chemical analysis for water, air, waste, and biological samples of environmental interest, as well as the analysis of xenobiotic compounds, their metabolites, and their effects in biological systems. Prerequisites: graduate standing, instrumental analysis.

430—Advanced Physical Chemistry (3).

431—Quantum Chemistry (3). Introduction to formal quantum mechanical theory, quantum measurement, simple model problems having exact solutions, angular momenta, approximation methods (perturbation theory, variation principle, WKB), and the structure of many-electron atoms. Prerequisite: 233 or equivalent. w.

432—Chemical Kinetics (3). Factors affecting rates, orders and mechanisms of chemical reactions, with emphasis on current theories and experimental techniques.

433—Computational Chemistry (3). Theory and application of modern computational techniques (molecular mechanics, ab initio and semiempirical molecular orbital methods) for predicting the structures, energies, and properties of molecules and molecular systems. Prerequisite: 233 or equivalent. w.

435—Magnetic Resonance (3). Basic principles of nuclear magnetic resonance (NMR) and electron spin resonance (ESR), nuclear spin relaxation, current experimental techniques and the application to studies of structures, dynamics and chemical analysis. Prerequisites: 212, 233 or equivalent.

439—Inorganic Polymer Chemistry (3). Designed for graduate students in Chemistry, Materials Science and Engineering. Aimed at offering the fundamental concepts in inorganic polymer chemistry with a particular emphasis on the recent advances in this field. Prerequisites: Chemistry 341 or prior approval by instructor.

440—Inorganic Mechanisms (3). Experimental stoichiometry and rate law determination. Isotopic applications. Methods and results of fast reaction studies. Basic known inorganic mechanisms. Experimental methods of establishing mechanisms of reaction.

441—Chemistry of the Main Group Elements (3). Descriptive inorganic chemistry of the main group elements. Textbook material extensively supplemented with information from the current chemical literature.

444—Inorganic Structural Methods (3). Chemical bonding, application of group theory, spectroscopy; diffraction as applied to structure determination; structural implications of dipole moment and magnetic susceptibility measurements.

450—Research (1-99). Does not lead to dissertation. f,w,s.

461—Advanced Radiochemistry (3). Reviews current advances in radiochemistry, hot atom chemistry, radiation chemistry, nuclear spectrometry. Prerequisite: 361 or equivalent. alt. f, even years.

462—Nuclear Chemistry (3). Designed for graduate students in chemistry and related fields. Studies nuclear reaction and nuclear properties. Prerequisites: 233, math 201 or prior approval of instructor.

490—Research (1-99). Research leading to thesis. Graded on a S/U basis only.

Civil and Environmental Engineering

College of Engineering
E2509 Engineering Building East (573) 882-6269

FACULTY — Columbia

Sam A. Kiger, chair, professor, PhD, PE, University of Illinois. Theoretical and applied mechanics; C.W. La Pierre Professor of Engineering.

Mark R. Virkler, director of graduate studies, associate professor, PhD, PE, University of Virginia. Transportation engineering.

Shankha K. Banerji, professor, PhD, PE, University of Illinois. Environmental engineering.

V. S. Gopalaratnam, professor, PhD, PE, Northwestern University. Structural/materials engineering.

Charles W. Lenau, professor, PhD, PE, Stanford University. Hydraulics.

Henry Liu, professor, director of the Capsule Pipeline Research Center, PhD, PE, Colorado State University. Hydraulics; James C. Dowell Professor of Engineering.

Jay B. McGarraugh, assistant dean, professor, PhD, PE, Purdue University. Structural engineering.

Michael G. Barker, associate professor, PhD, PE, University of Minnesota. Structural engineering.

John J. Bowders, associate professor, PhD, PE, University of Texas-Austin. Geo-environmental engineering.

Zhen Chen, associate professor, PhD, University of New Mexico. Mechanics.

Thomas E. Clevenger, associate professor, director of the Missouri Water Resources Research Center, PhD, University of Missouri-Columbia. Environmental engineering.

Brett W. Gunnink, associate chair, associate professor, PhD, PE, Iowa State University. Geotechnical engineering.

R. Lee Peyton, associate professor, director of the Center for Environmental Technology, PhD, PE,

Colorado State University. Water resources.
J. Erik Loehr, assistant professor, PhD, University of Texas-Austin. Geotechnical engineering.
Kristen L. Sanford, assistant professor, PhD, Carnegie Mellon University. Transportation engineering.
Robert L. Segar Jr., assistant professor, PhD, PE, University of Texas-Austin. Environmental engineering.

FACULTY — Coordinated Engineering Program, Kansas City
Deborah J. O'Bannon, director of graduate studies, associate professor, PhD, PE, University of Iowa. Environmental engineering.
Anil Misra, associate professor, PhD, PE, University of Massachusetts. Geotechnical engineering.
Stanley H. Niu, associate chair, associate professor, PhD, PE, University of Wisconsin. Structural engineering.
Jerry R. Richardson, assistant professor, PhD, PE, Colorado State University. Hydraulics.

DEGREES: MS and PhD in civil engineering

Graduate programs offered by the department prepare students for research and advanced engineering careers. Major program areas include structural mechanics, structural engineering, materials and geotechnical engineering, environmental engineering, hydraulics, hydrology and water resources engineering, and transportation engineering.

Emphasis areas within the structural mechanics, structural engineering, and materials programs include: fracture and failure of composites, numerical modeling, inelastic response of materials and structures, bridge engineering, linear and nonlinear structural dynamics, explosion resistant structural design, timber engineering, microstructure of porous materials, concrete and aggregate durability, and advanced fiber reinforced composites for construction.

The environmental engineering program emphasizes water pollution control, water purification, waste water treatment, the disposal of residues from these processes and hazardous and solid waste management options. Other areas of research interest include the application of physical, chemical and microbiological principles to design for water supply systems, pollution control facilities and contaminant transport through soils.

The geotechnical and geoenvironmental program emphasizes strength, deformation and flow properties of earthen materials and applies this understanding to foundation engineering, slope stability, earth structures, and geoenvironmental areas. Research areas include: soil improvement techniques, geosynthetic drainage, landfills and waste containment, stabilization and maintenance of earth slopes, rapid compaction of coal logs, in situ soil clean-up technologies and particulate mechanics.

The transportation engineering program emphasizes traffic engineering, intelligent transportation systems and infrastructure management. Additional areas include transportation planning, traffic flow theory, highway design, intersection operations, highway safety, pedestrian facilities, and advanced computing applications in these areas.

The hydrology, water resources and hydraulic engineering program focuses on fluid mechanics, pipeline hydraulics, capsule pipeline design, solute transport in soils, landfill hydrology, soil macropore flow and characteristics of organic chemical residuals in ground water systems.

The department has well-equipped laboratories for experimental research in structural engineering, materials and geotechnical engineering, environmental engineering and hydraulic engineering. Several computer-controlled electrohydraulic testing machines and associated instrumentation are available in the high-bay structural engineering and materials engineering laboratories. The laboratories are serviced by a 5-ton overhead crane. The geotechnical engineering laboratory houses state-of-the-art porosimetry, permeability, consolidation and triaxial testing equipment. An additional structural testing facility located south of the campus houses a 100-foot by 20-foot structural floor with anchor points on a 4-foot square grid. This high-bay facility is serviced by a 10-ton overhead crane. The environmental engineering laboratories are supplied with analytical equipment for the complete physical, chemical and microbiological analysis of water and waste water. A new laboratory has been established for research on solute transport of contaminants through soils. The hydraulic laboratory has two medium-size flumes and a 3-foot by 3-foot by 20-foot wind tunnel. The department also has a freight pipeline laboratory, which is one-of-a-kind in the world. Research in freight pipelines is supported by the Capsule Pipeline Research Center, the only National Science Foundation (NSF) funded research center in the state.

Besides the fellowships supported by the NSF, the Environmental Protection Agency and other governmental agencies, approximately 25 graduate research and teaching assistantships and industrial fellowships are available each year. Half-time appointments (20 hours a week) pay approximately $9,900 for a nine-month academic year, waive educational fees and permit the recipient to take up to 12 credit hours each semester.

Information regarding availability of financial support and further details about specific programs may be obtained by writing to the Director of Graduate Studies in Civil Engineering, E2509 Engineering Building East, Columbia, MO 65211.

MASTER'S DEGREE, THESIS AND NON-THESIS OPTION: An applicant with a BS degree in engineering and an undergraduate GPA of at least 3.0 or the equivalent (A=4.0) may be accepted for advisement upon CE Graduate Advisory Committee review. Applicants with BS degrees in related fields may be considered for admission. Non-engineers are required to complete requisite remedial courses. Test scores from the general test of the Graduate Record Examination (GRE) are required along with other application materials. TOEFL scores are required of international applicants. The minimum recommended score for TOEFL is 550.

The master's program requires a minimum of 30 credit hours. A minimum of 15 hours must be in courses at the 400 level. A final oral examination is required of all master's candidates. Approximately two weeks before this examination, a candidate must submit to an examining committee a thesis, a formal report or a design of professional quality applying the knowledge gained in course work to the solution of an engineering problem. Students who receive research appointments or traineeships are required to submit a thesis.

DOCTORAL DEGREE: Students are accepted for advisement upon CE Graduate Advisory Committee review. Formal acceptance to the PhD program is based on a written and oral qualifying examination, administered by faculty members in the student's area of concentration, during the first semester of post-master's work. In cases where students desiring PhD candidacy take a master's degree with thesis option in this department, the master's oral examination may be combined with the oral qualifying examination.

PhD programs are committee administered and tailored to fit the needs of each individual student. A minimum of 72 credit hours beyond the bachelor's degree is required. Up to 30 hours of credit may be given for the MS degree. The candidate must pass a comprehensive examination and submit and defend a dissertation at a final oral examination.

The coordinated engineering program at University of Missouri-Kansas City also participates in UMKC's unique interdisciplinary PhD program, which is fully described in the UMKC general catalog. This interdisciplinary program allows applicants to be admitted to the UMKC Graduate School to pursue studies encompassing at least two related disciplines upon the recommendation of the departments.

COURSES

Course numbers followed by K are offered through the Coordinated Engineering Program at the University of Missouri-Kansas City.

201K—Fundamental Topics in Civil Engineering (1-3). Special engineering topics for undergraduate students. Prerequisite: instructor's consent.

221—Structural Analysis I (4). Analysis of statically determinate beams, frames: shear and moment diagrams; influence line diagrams; beam deflections. Analysis of statically indeterminate structures; moment distribution: energy methods. Introduction to matrix analysis. Prerequisites: Engineering 195.

222—Reinforced Concrete Design (3). Basic principles of reinforced concrete design. Design of beams for flexure and shear; design of short and slender columns. Prerequisite: 221.

223—Structural Steel Design (3). Basic principles of structural steel design. Design of beams, axially loaded members, columns, and bolted and welded connections. Corequisites: 221.

232—Civil Engineering Materials (3). Introduces composition, structure, properties, behavior, and selection of civil engineering materials. Prerequisites: Engineering 195 or instructor's consent.

235—Soil Mechanics (3). Detailed study of physical and mechanical properties of soil governing its behavior as an engineering material. Prerequisite: Engineering 195.

242K—Hydraulics (3). Steady and unsteady flow in closed conduits, flow in multiple pipe systems, compound reservoir problems, gravity dam design gradually varied flow. Prerequisite: 251 w.

243K—Hydrology (3). Fundamental concepts of hydrology in engineering; quantitative estimation of stream-flow magnitude and frequency. Prerequisite: Mathematics 201.

251—Fluid Mechanics (3). (same as Mechanical and Aerospace Engineering 251). Concepts of statics and dynamics of fluids; emphasis on principles of continuity, momentum, energy. Includes brief introductions to compressible and potential flow and viscous effects. Prerequisites: 185 and Engineering 99 concurrently.

252—Hydrology (3). Fundamental concepts of hydrology in engineering; quantitative estimation of stream-flow magnitude and frequency. Prerequisite: Mathematics 201.

253—Fluid Mechanics Laboratory (1). Applications and demonstration of basic principles of fluid mechanics by experiment. Prerequisite: 251.

254—Applied Fluid Mechanics (2). Steady and unsteady flow in open channels and closed conduits, flow in multiple pipe systems, compound reservoir problems, gravity dam design, gradually varied flow. Prerequisite: 251.

255K—Soil Mechanics (3). Detailed study of physical and mechanical properties of soil governing its behavior as an engineering material. Prerequisite: 195.

266—Building Construction (3). Survey of materials used in building construction. Introduction to blueprint reading, quantity take-offs, and cost estimation . Special attention to building details, especially the integration of different building components.

274—Civil Engineering Systems Design (3). Design of civil engineering systems. Prerequisite: senior standing in Civil Engineering at the University of Missouri- Columbia or written consent of the University of Missouri- Columbia Civil Engineering Chairman.

274K—Design Practice (4). Comprehensive realistic team design project using the systems approach. Design constraints, variables, and optimization. Managerial and professional aspects of design practice. Prerequisite: senior standing.

291K—Water Quality (4). Methods for determining and characterizing water quality, effects of pollution on streams and lakes, and an introduction to engineered systems for the distribution, collection and treatment of water and wastewater. Prerequisite: junior standing. w

292—Water and Wastewater Treatment Processes (3). Physical, chemical and biochemical processes for treating drinking water supplies, domestic and industrial wastewaters, including planning and design of such facilities. Prerequisites: junior standing and Chemistry 31 or equivalent.

300—Problems (2-4). Directed investigation of civil engineering. Prerequisite: instructor's consent.

301—Topics in Civil Engineering (3). Study of current and new technical developments in civil engineering. Prerequisite: instructor's consent.

304—Digital Computer Applications in Engineering (3). Use of digital computer for solution of engineering problems involving roots of equations, simultaneous equations, curve fitting, integration, differentiation, and differential equations. Prerequisite: Mathematics 201.

323—Advanced Structural Steel Design (3). Design of steel structures and bridges. Topics include composite beams, plate girder design, and moment resistant connections. Prerequisite: 223.

331—Prestressed/Advanced Reinforced Concrete (3). Principles of prestressing. Constituent materials, loading and allowable stresses. Working and ultimate stress analysis and design. Shear and torsion. Deflections. Prestress losses. Continuous beams. Composite beams. Compression members. footings. Corequisite: CE 222.

335—Earthwork Engineering and Design (3). Study of concepts, theories, and design procedures for modern earthwork engineering including: compaction and densification of soils and soil improvement, seepage and drainage, slope stability and performance, and earth retaining structures. Prerequisite: CE 235.

342—Hydraulics of Open Channels (3). Gradually varied flow and theory of the hydraulic jump. Slowly varied flow involving storage; rating curves. Prerequisite: 251.

343—Applied Hydrology (3). Modern methods of applied hydrologic analysis and synthesis of hydrologic records. Prerequisites: 251 and 252; or instructor's consent.

345—Pipeline Engineering (3). (same as Mechanical and Aerospace Engineering 345) Theoretical and practical aspects of pipeline engineering including pipeline transport of natural gas and various solids such as coal, sand and solid wastes. Prerequisites: 251 and Mechanical & Aerospace Engineering 251.

348—Solid Waste Management (3). Engineering principles involved in generation, handling, collection, transport, processing, and disposal of solid wastes, resource recovery and reuse, legislation on solid wastes and groundwater contamination problems. Prerequisite: junior standing.

349—Hazardous Waste Management (3). Engineering principles involved in handling, collection, transportation, processing and disposal of hazardous wastes, waste minimization, legislation on hazardous wastes and groundwater contamination.

350—Honors Research (2-3). Independent project, supervised by the honors advisor, to be presented as a formal written report. Prerequisite: participation in the Civil Engineering Department Honors program.

352—Advanced Mechanics of Materials (3). (same as Mechanical and Aerospace Engineering 352). Analysis of more complicated problems in stresses, strains. Prerequisite Engineering 195.

365—Engineering Administration (3). Cash flow analysis, financial analysis, managerial accounting and cost control, budgeting, organizational structure and behavior. Prerequisite: Junior standing and Math 60 or 80, or instructor's consent.

367—Introduction to Construction Management (3). Structure of the construction industry; construction drawings and specifications; estimating and bidding; construction contracts, bonds and insurance; planning and scheduling of construction operations; project management; computer techniques. Prerequisite: junior standing.

368—Quality Management in Civil Engineering (3). Quantitative and qualitative quality planning and analysis concepts, including statistical tools and total quality management techniques, control, measurement and assessment. Prerequisite: senior standing. Letter grading only.

369—Construction Methods and Equipment (3). Selection and use of construction equipment, planning construction operations, equipment economics and operations analyses. Prerequisite: Junior standing and Math 60 or 80, or instructor's consent.

372—Foundation Engineering (3). Subsurface exploration. Design of basic foundation structures: shallow foundations, retaining walls, deep foundations. Prerequisites: 235.

375—Matrix Methods of Structural Analysis (3). An introduction to the fundamentals of stiffness and flexibility methods for analysis of truss and frame structures. Application of the STRUDL and NASTRAN programs to three dimensional structures. Prerequisite: 221. f,w.

381—Traffic Engineering (3). Characteristics and studies associated with highway traffic. Capacity analysis and evaluation of freeways, rural highways, and urban streets. Traffic signal control and coordination. Prerequisites: Mathematics 201.

384—Pavement Materials and Design (3). Properties of materials used in roads, airports and other pavement construction. Design methods for rigid and flexible pavements. Prerequisites: Engineering 195.

385—Vibration Analysis (3). (same as Mechanical and Aerospace Engineering 385). Vibration theory with application to mechanical systems. Prerequisites: 185 and Mathematics 304.

391—Introduction to Water Quality (3). Methods for determining and characterizing water quality, effects of pollution on streams and lakes, and an introduction to engineered systems for the distribution, collection and treatment of water and wastewater. Prerequisite: junior standing. w

393—Environmental Engineering Microbiology (3). Theory and application of fundamental principles of microbiology, ecology, and aquatic biology of the microorganisms of importance to sanitary engineers. Prerequisite: senior standing or instructor's consent.

394—Sanitary Engineering Chemistry (3). Applications of chemical theory and concepts of operations commonly employed in water and waste-water treatment to pollution from persistent chemicals and to specific control parameters. Prerequisites: senior standing or instructor's consent.

394K—Hazardous Waste and Aquatic Chemistry (3). Redox, carbonate chemistry, sorption topics. Innovative processes for hazardous waste treatment. Prerequisites: Chemistry 211. Letter grading only.

395—Water Quality Analysis (3). Chemical, physical and biological methods for analysis of streams, lakes, wastewaters and water supplies and their use in water quality management. Prerequisite: 391 or instructor's consent.

396—Planning and Geometric Design of Highways (3). Techniques of highway planning in rural and urban areas. Design of the visible elements of highways. Prerequisites: 113 and Mathematics 201.

397K—Environmental Public Policy (3). Engineering and economic aspects of environmental policy. Basic understanding of environmental statutes and case law. Prerequisite: English 304. Graded on A-F basis. f, odd yrs.

398—Environmental Compliance, Auditing and Permitting (3). Statutes, regulations and permitting for air hazardous wastes and storage tanks. Asbestos, radon, EMF, and emerging areas of regulatory concern. Siting issues. Criminal and civil enforcement.

400—Problems (1-6). Supervised investigation in civil engineering to be presented in the form of a report.

401—Advanced Topics in Civil Engineering I (1-3). New and current technical developments in civil engineering. Prerequisite: 304 or equivalent.

402—Directed Reading In Civil Engineering (1-3). Faculty supervised readings course, Prerequisite: graduate standing. f,w,s.

410—Seminar (1). Review of research in progress. Research techniques.

411—Continuum Mechanics (3). (same as Mechanical and Aerospace Engineering 411). Introductory course in the mechanics of continuous media. Basic concepts of stress, strain, constitutive relationships; conservation laws are treated using Cartesian tensor notation. Examples from both solid and fluid mechanics investigated. Prerequisites: 251, Mathematics 304, Engineering 195.

412—Theory of Elasticity (3). (same as Mechanical and Aerospace Engineering 412). Stress and strain at a point. General equations of elasticity. Plane stress, plain strain problems; torsion of prismatic bars. Energy methods.

413—Theory of Plates and Shells (3). (Same as Mechanical and Aerospace Engineering 413). Rectangular and circular plates. Variational methods in the analysis of plates and shells. Plates of unusual shape. Shear deformation effects. Large deformation analysis. Analysis of cylindrical shells.

414—Theory of Elastic Stability (3). (Same as Mechanical and Aerospace Engineering 414). Buckling of Columns, frames, arches and other structural systems. Kinematic approach to stability. Large deflections. Energy approach to buckling. Plate and shell buckling. Inelastic buckling of columns. Creep buckling.

416—Theory of Plasticity (3). (same as Mechanical and Aerospace Engineering 416). Plastic yield conditions and stress-strain relations. Behavior of elastic-perfectly plastic

members. Plain strain in plastic members. Prerequisites: 412 or instructor's consent.

420—Materials and Measurement (3). About 25% of the course is devoted to the physical measurement of strain, force, displacement and motion. Remainder of course is devoted to advanced study of the behavior of steel and concrete with emphasis on brittle fracture in steel. Prerequisites: 232 or equivalent.

421—Advanced Topics Structural Analysis (3). Computer implementation and application of finite element analysis. Material and geometric nonlinearities. Plastic analysis of structures. Code provisions for analysis of seismic and wind loadings. Prerequisite: 375.

423—Structural Analysis (3). Classical and modern methods for elastic analysis. Influence line, Miller-Breslau principle. Introduction to force and displacement methods using matrix analysis. Application to continuous beams, grids, plane and space frames and trusses.

429K—Structural Practicum (2-4). Application of advanced analysis and design techniques to practical problems in structural engineering. Collaborative group investigations that may include experimental and computer-aided studies. No more than 6 practicum hours may be applied toward the MS degree. Prerequisite: graduate standing in Civil Engineering. Letter grading only.

431—Seepage, Drainage, and Filtration (3). General principals that govern flow of water through soils and specific procedures for analysis and design of filtration and drainage media in geotechnical and geoenvironmental applications. Prerequisite: CE 235 or instructor's consent.

434—Stability and Performance of Earth Slopes (3). Principles, mechanics and procedures for analyzing the stability of earth slopes and landfills under short-term, long-term, rapid drawdown, and earthquake conditions. Prerequisite: CE 235 or instructor's consent.

436—Advanced Soil Mechanics (3). Theoretical soil mechanics as applied to solution of specific engineering problems. Prerequisite: 355 or equivalent.

437—Advanced Geotechnics (3). Advanced study of specific geotechnical engineering topics. Topics may include: Environmental Geotechnics, Landfill Design, Geosynthetics, Laboratory Testing, and Case History. May be repeated for credit when topics vary. Prerequisite: CE 235 or instructor's consent.

439K—Geotechnical Practicum (2-4). Application of advanced analysis and design techniques to practical problems in geotechnical engineering. Collaborative group investigations that may include experimental and computer aided studies. No more than 6 practicum hours may be applied toward the MS degree. Prerequisite: graduate standing in Civil Engineering. Letter grading only.

441—Advanced Hydraulic Engineering (3). Unsteady flow in pipes and open channels is studied using the method of characteristics and finite difference equations. Hydraulic transient in pipe networks due to valve adjustments, pump startup and pump power failure are analyzed. Control of transient using surge tanks and air chambers is included. Prerequisite: 254.

445—Water Quality Modeling (3). Derivation and application of models for describing oxygen budget, nutrient exchange, and biological productivity in streams, lakes and estuaries. Prerequisite: 391.

447—Groundwater Pollution Evaluation and Modeling (3). Fundamentals of groundwater hydraulics and groundwater contamination. Use and development of computer models to simulate flow and pollutant transport. Prerequisites: 251, Mathematics 304, or instructor's consent.

449—Advanced Hazardous Waste Treatment Processes (3). (same as Chemical Engineering 449). Course includes some introductory materials about hazardous waste regulations followed by advanced treatment methods such as air stripping, soil-vapor extraction, chemical oxidation, membrane processes, in-situ and ex-situ biotreatment methods, solidification and thermal processes. Prerequisite: CE 349.

449K—Hydrotechnical Practicum (2-4). Application of advanced analysis and design techniques to practical problems in hydrotechnical engineering. Collaborative group investigations that may include experimental and computer aided studies. No more than 6 practium hours may be applied toward the MS degree. Prerequisite: graduate standing in Civil Engineering. Letter grading only.

459—Dynamics of Structures (3). (same as Mechanical and Aerospace Engineering 459). Study of the dynamic behavior of structures. Analysis of equivalent lumped parameter systems for the design of structures in a dynamic environment. Prerequisites: 421 or equivalent, Proficiency in Digital Computer Programming, or instructor's consent.

460—Fundamentals of Fluid Mechanics (3). Treatment of fundamental concepts and theories in fluid mechanics at a level suitable for beginning graduate students. Prerequisites: 251 or equivalent.

464—Hydrodynamics (3). Special topics in potential theory and conformal mapping. Prerequisite: 461.

465—Wind Engineering (3). Study of wind effects on the safety of engineering structures, air pollution and building energy consumption, and the use of wind. Prerequisite: 251. w.

472—Behavior of Reinforced Concrete Members (3). The design philosophy, constitutive laws, creep rate sensitivity and aging, shrinkage. Nonlinear response of reinforced concrete members. Deflection computation and control. Bond and anchorage . Prerequisite: 222.

483—Transportation Planning and Models (3). Regional and metropolitan transportation studies; land use, traffic generation, distribution and assignment models. Prerequisites: 370 or 373.

484—Theory of Traffic Flow (3). Scientific approach to study of traffic phenomena with emphasis on applications. Deterministic and stochastic models of traffic flow; optimization of intersection controls; computer simulation of traffic problems. Prerequisites: 370 or instructor's consent.

486—Finite Element Methods (3). (same as Mechanical and Aerospace Engineering 486).

490—Research (1-99). Independent investigation in the field of civil engineering to be presented in the form of a thesis. Graded on a S/U basis only.

491—Unit Process Laboratory (3). Studies chemical and physical relationships as applied to unit processes of water and wastewater. Prerequisites: 292.

492—Physiochemical Treatment Processes (3). Fundamental principles, analysis and modeling of physical and chemical processes for water and wastewater treatment. Prerequisite: 292.

493—Biochemical Treatment Processes (3). Biochemical principles, kinetic models and energy considerations in the design of biological wastewater treatment processes. Prerequisite: 292.

494—Water and Wastewater Residuals Handling, Treatment and Disposal (3). Water and wastewater residue production, characterization or residues, residue management options, residue treatment processing-conditioning, dewatering, stabilization, land disposal, landfills and thermal processes. Prerequisite: 392 or equivalent.

496—Design of Water and Wastewater Treatment Facilities (3). Development of design criteria and their application to the design of water and wastewater treatment facilities. Prerequisite: 292.

498—Engineering Aspects of Water Quality (3). Theoretical aspects of biological, chemical, physical processes; applications in water, wastewater, industrial-waste treatment processes, natural water systems; chemical equilibria, flow models; reaction kinetics on process design, pollutants. Prerequisites: 391 or instructor's consent.

499K—Environmental Practicum (2-4). Application of advanced analysis and design techniques to practical problems in environmental engineering. Collaborative group investigations that may inlcude experimental and computer-aided studies. No more than 6 practicum hours may be applied toward the MS degree. Prerequisite: Graduate standing in Civil Engineering. Letter grading only.

Classical Studies

College of Arts and Science
420 General Classroom Building (573) 882-0679

FACULTY

John M. Foley, chair, professor, PhD (English and comparative literature), University of Massachusetts. Oral tradition; Homer.

Eugene N. Lane, director of graduate studies, professor, PhD, Yale University. Comparative grammar; Late Antiquity; Ancient Religion.

Daniel M. Hooley, director of undergraduate studies, associate professor, PhD (English), PhD (classics), University of Minnesota. Classical tradition; translation studies.

Charles Saylor, professor, PhD, University of California. Roman comedy; Latin literature.

Theodore A. Tarkow, professor, PhD, University of Michigan. Greek drama; Greek lyric poetry.

David J. Schenker, associate professor, PhD, University of California. Greek drama.

Barbara P. Wallach, associate professor, PhD, University of Illinois. Classical rhetoric and oratory; Lucretius; Cicero.

Shilpa Ravel, assistant professor, PhD, Brown University. Augustan poetry, gender studies.

DEGREE: MA in classical languages; PhD in classical studies

The Department of Classical Studies offers graduate work leading to the master of arts degree in classical languages with emphasis on Latin, Greek or both classical languages. The PhD degree in classical studies requires work in both Greek and Latin.

Graduate programs in classical studies are designed to prepare students for professional careers as teachers and scholars of classical literature and ancient civilization. Besides acquiring expertise in the traditional classical disciplines, students are encouraged to become familiar with other areas, such as later literatures and cultures, on which the classical tradition has exercised a decided effect.

Since MU is a contributing member of the American Academy in Rome and the American School of Classical Studies in Athens, the facilities of those organizations are available to graduate students from Missouri. Study in Athens or Rome is often feasible after the completion of a master's degree. On campus, students have at their disposal the resources of Ellis Library, which are excellent in the major fields of Greek and Latin languages and literatures, and in ancillary fields. This collection is supplemented by the department's Walter Miller Collection and the departmental computer resources, including an Ibycus word processor, the TLG disk, PHI disks, and the Perseus program. The Museum of Art and Archaeology contains many items of interest to classicists.

MASTER'S DEGREE: The requirements for

acceptance for advisement in the MA program include a bachelor of arts degree from an accredited college or university, a reading knowledge of Greek and/or Latin, a GPA of at least 3.0 (A=4.0) in Greek and/or Latin courses, and an overall GPA of at least 3.0 (A=4.0) or the equivalent during the last two years of undergraduate work.

The minimum course of study is 30 semester hours. Of these, at least 12 hours in Greek, Latin, classics and related fields must be at the 400 level or above, and at least six hours must be in courses in other departments. At least 21 of the 30 hours must be completed in Greek, Latin or classics in the department. Students who wish to have a minor may take 10-12 hours in another department or complete an ancient studies minor. Classics 409 is required of all students during their first year of graduate study.

Although some command of German and French (or Italian) is necessary from the outset, MA candidates are required to have demonstrated proficiency in one of the languages by the time that they begin their second year of graduate study.

Upon beginning study for the MA, each candidate will be given departmental reading lists in one or both languages, depending upon the degree sought, and be responsible for completing the appropriate lists. A written examination on the reading list(s) is part of the final examination for the degree.

A final oral examination is given by a faculty committee selected by the student in consultation with the adviser. If a thesis has been submitted (optional), this examination will include defense of the thesis and questions related to the thesis.

DOCTORAL DEGREE: The requirements for acceptance for advisement in the PhD program include an MA degree with a major in Greek, Latin or classics, or the equivalent of a minimum of 21 hours of graduate work in the language(s) providing a good reading knowledge of Greek and Latin and a reading knowledge of German and French (or Italian).

Proficiency in one of the modern foreign languages (i.e., French, German or Italian) must be demonstrated by the time of registration for the second year of graduate study; proficiency in the second language must be demonstrated by the time of registration for the third year.

A minimum of 72 hours of graduate credit is required for the PhD degree. A maximum of 30 hours of this may consist of hours transferred from the MA degree. At least 21 additional hours must be taken in the department at the graduate level. A minimum of eight hours of dissertation credit is required. All candidates must include in their program of study a minor or area of concentration consisting of at least 12 hours at the graduate level outside the department. Suggested areas include ancient history, classical archaeology, the classical tradition, late antiquity, the oral tradition, rhetoric, or romance languages. A structured minor in ancient studies also is available. At least one course in ancient history and one course in classical archaeology must be taken at the graduate level. Proficiency in Greek and Latin composition must be demonstrated at some point by course work or examination.

After completing residency, language and course requirements, PhD candidates must pass the comprehensive examination consisting of five written examinations in the following fields: Greek literature, Latin literature, special Greek author, special Latin author, and area of concentration or minor field. In lieu of either special author, a special topic may be offered. With the approval of the adviser and the candidate's committee, extra course work beyond the required 12 hours may be substituted for the written examination in the area of concentration or minor field. Ancient Studies minors are automatically excused from the examination in the minor field.

The oral comprehensive examination is taken only after the candidate successfully passes the written examinations. Within one month of completion of both written and oral comprehensive exams, or at the beginning of the fall term if the exams are taken in May, the candidate must meet with the doctoral program committee to obtain formal approval of the dissertation topic. Continuous enrollment must be maintained while the candidate completes the dissertation. A final oral defense of the dissertation is held upon completion of the dissertation.

COURSES

CLASSICAL HUMANITIES

124—Greek Classics in Translation (3). Reading in translation and critical study of the most important literary works of the ancient Greek World.

125—Roman Classics in Translation (3). Reading in translation and critical study of the most important literary works of the ancient Roman world.

201—Topics in Classical Studies (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: CH 60, any CH 100 course, or instructor's consent.

204—The Age of Pericles (3). A study of the literature and culture of the 5th and early 4th centuries B.C. in Athens. Authors will include Thucydides, Herodotus, Xenophon, Plato, Aristotle, the tragedians and Aristophanes. Prerequisites: 60 or any 100 level course, or instructor's consent.

205—The Age of Augustus (3). Study of the literature of the Age of Augustus; Vergil, Ovid, Horace, Livy, and Propertius. Prerequisites CH 60, or any CH 100 level course, or instructor's consent.

206—Power and Oratory in Ancient Greece (3). (same as History 204). Concentrates on the rise of oratory in Greece and how oratory was exploited for political ends. Special attention will be paid to the Athenian Democracy in the fifth and fourth centuries BC. Prerequisite: sophomore standing or instructor's consent.

223—Greek and Roman Epic (3). A study of the major representatives of the ancient epic genre. Readings will include Homer's "Iliad" and "Odyssey". Apollonius' "Argonautica", Vergil's "Aeneid". Prerequisite: Classical Humanities 60 or any Classical Humanities 100-level course, or instructor's consent.

226—Greek Drama (3). Reading and interpretation of Greek tragedies and comedies in translation. Prerequisite: CH 60 or any CH 100 level course or instructor's consent.

227—Advanced Mythology (3). Interpretation of selected classical myths and their influence on later literature and art. Prerequisite: CH 60, or any CH 100 level course, or instructor's consent.

228—Murder and Mayhem, Images of Justice in Classical Antiquity (3). Ideas of justice from Homer through the early Roman Empire; personal vengeance, law courts and trials, philosophical attitudes, women and courts, techniques of persuasion. Prerequisites: CH 60, any CH 100 level course, or instuctor's consent.

229—Greek and Roman Characters and Ideals (3). Study of selected types of characters admired and imitated or hated and rejected in classical antiquity; heroes, philosophers, women. Prerequisite: CH 60, any CH 100 level course, or instructor's consent.

230—The Ancient Novel (3). Reading and analysis of Greek and Latin prose fiction: ideal and comic romance, fantasy, romantic biography; Hellenistic background. Prerequisite: CH 60, any CH 100 level course, or instructor's consent.

231—Paganism and Christianity (3). A study of the transition from Paganism to Christianity in the Roman Empire, as seen by observers contemporary with the events (in English translations, many new). Prerequisites: CH 60, any CH 100 level course, or instructor's consent.

232—Women in the Ancient World (3). Using classical literary texts as our central focus we will examine the role of women: the conflict inherent in their obligations and their identity in the context of these obligations. Prerequisites: CH 60, or CH 100 level course, or instructor's consent.

235—Classics in a Cross-Cultural Context (3). The goal of this course is to place classical literature in a multicultural context by studying Greek and Latin literary texts alongside verbal art from non-European as well as European cultures. Prerequisites: CH 60, or CH 100 level course, or instructor's consent.

260—Greek and Roman Religion (3). (same as Religious Studies 259). Survey of religious development among the Greeks and Romans. Prerequisite: 60 or Art History and Archaeology 10 or History 102; sophomore standing.

301—Topics in Classical Studies (1-99). Subjects and earnable credit may vary from semester to semester. Prerequisites: any CH 200 level course or instructor's consent.

340—Literature and Culture of the Hellenistic Age (3). A survey of the literature and culture of the Hellenistic Age. Prerequisites: any CH 200 level course, or instructor's consent.

352—The Classical Tradition (3). Selected studies in continuity and influence of Greek and Roman culture on Middle Ages, Renaissance, and modern times. Prerequisite: any CH 200 level course or instructor's consent.

365—Classical Literature and Culture in Translation (1-3). Classical Authors and secondary works illustrating aspects of Graeco-Roman civilization. Recommended for classical civilization majors. Prerequisite: any CH 200 level course or instructor's consent.

CLASSICS

201—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

293—Honors Proseminar (3-6). Limited to Honors undergraduates. To be taken in senior year. Integrated exploration of classical civilization. May repeat to 6 hours maximum. Prerequisite: limited to Honors undergraduate, to be taken in senior year.

311—History of the Greek and Latin Languages (3). (same as Linguistics 313). Evolution of classical languages and their relationship to each other.

330—Introduction to Text Criticism and Paleography (3). Latin and/or Greek textual criticism and paleography, using manuscript facsimiles at the University library. Prerequisite: 2 years of Classical Languages or equivalent.

340—Ancient Pastoral (3). Reading and interpretation of pastoral poetry and prose in Greek and Latin; emphasis on Theocritus, Virgil, and Longus. Prerequisite: 2 years each of Greek and Latin.

350—Special Readings (1-3). Readings in authors and texts not covered in other courses. Prerequisite: classics/classical civilization—departmental consent; Greek—two years classical Greek or equivalent; Latin—two years Clas-

sical Latin or equivalent.
365—Classical Literature and Culture (1-3). Survey of primary and secondary works illustrating aspects of Graeco-Roman civilization. Recommended for: Greek, Latin, or Classics majors. Prerequisites: 2 years classical Greek, or Latin, or equivalent; junior standing: departmental consent.
380—Advanced Study in the Teaching of the Classics (3). Prerequisites: classroom teaching experience or chairman's consent.
409—Introduction to Graduate Study in Classics (1). Required of all first-year graduate students.
415—Seminar in Classical Mythology (3). Intensive study of classical mythology in origin, development, meaning and influence. Prerequisite: instructor's consent.
425—Seminar in the Hellenistic Age (3-6).
435—Seminar in Ancient Rhetoric and Oratory (3).
437—Seminar in Ancient Literary Criticism (3). Principles and theories of ancient Greek and Latin literary criticism, as developed in significant works on the subject.
445—Graeco-Roman Didactic (3-6). Critical and comparative study of Greek and Latin didactic poetry with emphasis on major authors from Hesiod through the Augustan Age. Prerequisite: graduate standing.
455—Seminar in Greco-Roman Religion (3).
465—Seminar in Greco-Roman Satire and Social Criticism (3).
475—Seminar in the Age of the Antonines (3-6).
490—Research and Thesis (1-8). Individual research in preparation for writing thesis and/or dissertation. Graded on a S/U basis only.

GREEK

207—Intensive Beginning Greek I (3). Intensive study of forms, grammar, syntax; early attention to readings in simple prose. Course meets five hours weekly for 3 hours credit. Prerequisite: graduate standing.
208—Intensive Beginning Greek II (3). Continuation of 207. Attention to ability to read rapidly and accurately. Course meets five hours weekly for three hours credit. Prerequisite: graduate standing.
209—Intensive Greek Reading (2).
210—Intermediate Readings (3). Selected advanced readings in prose and poetry. Introduction to Homer. Prerequisite: Greek 3 or equivalent.
216—The Greek New Testament (3). (same as Religious Studies 216). Readings in the Greek New Testament and similar literature, e.g., the Septuagint. Prerequisite: Greek 210 or instructor's consent. Graded on A-F basis only.
301—Topics (1-99). Organized study of selected authors or eras. Subject and earnable credit vary from semester to semester. Prerequisite: two years of Classical Greek or equivalent.
303—Greek Stylistics (1-3). Study and practice of general Greek prose tendencies, with special consideration to basic problems: abstract expression, word order, sentence structure and use of common rhetorical devices.
304—Greek Tragedy (3). Selected works of Aeschylus, Sophocles, Euripides, with special attention to language, style, ideas, and dramatic techniques. Prerequisite: two years Classical Greek or equivalent.
305—Greek Comedy (3). Selected plays of Aristophanes and Menander, with special attention to cultural contexts. Prerequisite: two years Classical Greek or equivalent.
306—Greek Lyric Poetry (3). Selected readings from lyric poets, with attention to verse, forms, and dialects. Prerequisite: two years Classical Greek or equivalent.
307—Greek Oratory (3). Selections from Greek orators, with emphasis on Lysias and Demosthenes. Prerequisite: two years Classical Greek or equivalent.
308—Greek Philosophers (3). Emphasis on readings and analysis of selected texts of major Greek philosophers. Prerequisite: two years Classical Greek or equivalent.
310—Greek Historians (3). Reading and analysis of selected texts of major Greek historians. Prerequisite: two year Classical Greek or equivalent.
315—Homer (3). Reading, discussion, and literary analysis of Iliad and Odyssey. Prerequisite: two years Classical Greek or equivalent.
325—Greek Epigraphy (3). Introduction to study of Greek inscriptions and their contribution to the understanding of other aspects of ancient culture. Prerequisite: Greek 3.
350—Special Readings (1-3). Readings in authors and texts not covered in other courses. Prerequisites: departmental consent, two years Classical Greek or equivalent.
399—Survey of Greek Literature (3). Greek literature from origins to end of Roman period; emphasis on authors not covered in other courses, to provide general view of styles and genres. Prerequisite: two years Classical Greek or equivalent.
405—Proseminar in Greek Texts (3). This is a seminar-level introduction to Greek literary and historical texts. The emphasis in this course will be on wide and intensive reading, with the objective of helping the new graduate student quickly develop a sound literary and linguistic competence.
406—Greek Historiography (3). (same as History 405). Study of the major contemporary historians of Classical Greece and their methodology. Differential readings available to both students with a reading knowledge of Greek and also those without Greek.
425—Seminar in Greek Drama (3). May be repeated to a maximum of 6 hours.
440—Seminar in Greek Lyric Poetry (1-99).
450—Seminar in the Greek Philosophers (3).
460—Seminar in the Greek Historians (3).
470—Seminar in Greek Epic Poetry (3).
475—Seminar on the Age of Pericles (3-6). Study of Greek culture of mid-fifth century B.C., including law, religion, art, philosophy, science, and other aspects of the culture, to give students an integrated view of life of the period.
480—Seminar in Special Fields (3).

LATIN

207—Intensive Beginning Latin I (3). Intensive study of morphology, grammar, syntax; early attention to readings in simple prose. Course meets five hours weekly for 3 hours credit. Prerequisite: graduate standing.
208—Intensive Beginning Latin II (3). Continuation of 207. Readings in Latin prose. Prerequisites: graduate standing.
209—Intensive Latin Reading (2).
210—Latin Poetry (3). Readings in selections from the Latin poets. Prerequisite: 3 or equivalent.
211—Latin Prose (3). Selections from various Latin prose writers; some composition at instructor's discretion. Prerequisite: 3.
303—Latin Stylistics (1-3). Study and writing of connected prose compositions. Prerequisite: two years classical Latin or equivalent.
305—Age of the Scipios (3-6). Critical readings in and integrated analyses of the culture of the second century B.C. Prerequisite: two years Classical Latin or equivalent.
310—Age of Cicero (3-6). Critical readings in and integrated analyses of the culture of the last decades of the Roman Republic. Prerequisite: two years Classical Latin or equivalent.
315—Vergil (3). Readings, discussion, and literary analysis of Vergil's Aeneid. Prerequisite: two years of Classical Latin or equivalent.
320—Augustan Literature (3-6). Critical readings in and integrated analyses of the culture of Augustan Rome. Prerequisite: two years Classical Latin or equivalent.
325—Latin Epigraphy (3). Introduction to the study of Latin inscriptions and their contributions to ancient culture. Prerequisite: two years Classical Latin or equivalent.
335—Neronian Literature (3-6). Critical readings in and integrated analysis of culture of the age of Nero. Prerequisite: two years Classical Latin or equivalent.
340—Age of Pliny and Tacitus (3-6). Critical readings in and integrated analyses of the ages of Domitian and Trajan. Prerequisite: two years Classical Latin or equivalent.
350—Special Readings (1-3). Readings in authors and texts not covered in other courses. Prerequisites: two years Classical Latin or equivalent.
376—Medieval Latin (3). Selected texts of Middle Ages and Renaissance. For students with primary interest in history, literature, philosophy, religion, Romance philology, or the classical tradition, experience with Latin sources in their field. Prerequisite: instructor's consent.
399—Survey of Latin Literature (3). Latin literature from origins to end of Roman Empire; emphasis on authors not covered in other courses, to provide general view of styles and genres. Prerequisite: two years Classical Latin or equivalent.
405—Proseminar in Latin Texts (3). Prerequisite: graduate status or instructor's consent.
410—Seminar in Roman Comedy (3).
420—Seminar in Latin Lyric and Elegiac Poetry (3).
430—Seminar in Neronian Literature (3).
450—Seminar in Roman Historians (3).
470—Seminar in Latin Epic Poetry (1-99).
475—Seminar in the Augustan Age (3-6). Integrated studies in the culture of the age of Augustus—its literature, art and architecture, religion, political and social institutions.
480—Seminar in Special Fields (3).

Communication

College of Arts and Science
115 Switzler Hall (573) 882-4431

FACULTY

Mary-Jeanette Smythe, chair, associate professor, PhD, Florida State University. Persuasion; communication and culture; nonverbal communication and communication apprehension.
Michael W. Kramer, director of graduate studies, associate professor, PhD, University of Texas. Organization communication, including: assimilation; transitions; emotions and superior and subordinate communication.
William L. Benoit, professor, PhD, Wayne State University. Rhetorical theory and criticism; attitude change; argumentation; verbal reports and conversational memory.
James W. Gibson, professor emeritus, PhD, The Ohio State University. Political communication, speech education and business applications of communication.
Loren Reid, professor emeritus, PhD, University of Iowa. Rhetoric and public address.
Pamela J. Benoit, associate professor, PhD, Wayne State University. Conversational structure, argument and impression management.
Michael J. Porter, associate professor, PhD, University of Iowa. Television audience analysis; visual literacy; structure of television narratives and communication education.
Jon A. Hess, assistant professor, PhD, University of Minnesota. Interpersonal communication, communication ethics, and instructional communication.
Michael T. Stephenson, assistant professor, PhD, University of Kentucky. Mass media, media effects.
David Dunkin, adjunct professor, MA, University of Missouri. Television production and technology.
Michael W. Dunn, adjunct professor, PhD, University of Michigan. Broadcast management and

programming.

Roger Karwoski, adjunct professor, MS, University of Wisconsin, Platteville. Programming and production.

DEGREES: MA and PhD in communication

The program takes a theoretical, critical and experimental approach to the study of communication.

The MA program is designed to further enhance the understanding of the communication process by allowing students to study various aspects of communication in greater depth. Graduates are employed in corporate communications, educational and instructional media, sales, research and consulting.

The doctoral program is designed for those interested in an academic career of college or university teaching and research. Doctoral students graduate with a broad-based theoretical background that encompasses all phases of communication studies, including interpersonal, organizational, persuasion, rhetoric, mass media, critical and cultural studies.

Graduate students are eligible to apply for fellowships, work-study grants and graduate teaching assistantships.

MASTER'S DEGREE: To be accepted for advisement, a student must present:

- transcripts for all college work,
- three letters of recommendation,
- results of the GRE general test,
- a statement of purpose (no more than 500 words) explaining the student's intended field of study, professional goals and other reasons for wishing to enter the graduate program and
- a substantial sample of written work (such as a term paper).

Students who do not have an undergraduate degree in communication may be required to take course work beyond the required 30 hours to remedy their deficiency.

Not more than six semester hours of the required 30 hours of credit may be transferred from another university or campus of the University of Missouri System.

The master of arts degree may be completed under either a thesis option, approved by an advisory committee, or a nonthesis option (with a comprehensive examination). Both plans require a minimum of 30 hours of graduate credit, including at least 15 hours of course work at the 400 level.

There is no language requirement.

No more than nine hours of course work or independent study in television production or scriptwriting will be accepted for the MA degree. Students may opt to take more production hours but they may not be included in the candidate's plan of study.

MA candidates may take up to six hours of credit for their MA project.

For the assignment of advisers, students should see the director of graduate studies.

DOCTORAL DEGREE: Admission procedures for students who have completed the MA degree elsewhere and wish to become PhD candidates are identical to the departmental requirements outlined for MA candidates.

Only those applicants who show evidence of a clear likelihood of successful doctoral work are admitted. Before registering for courses, the student must confer with the director of graduate studies who acts as temporary adviser until a permanent adviser is assigned.

A doctoral program committee approves the student's course of study and reads the qualifying examination. Only after passing the qualifying examination will the student be admitted to candidacy for the PhD degree in communication. For a student whose MA program was done at MU, the six-hour comprehensive examination or the MA thesis defense constitutes the qualifying examination. The student may proceed beyond the MA degree only upon the recommendation of the MA examining committee.

The PhD candidate must take approximately 48 hours of course work beyond the MA. Students with an MA degree in another discipline may be required by their doctoral program committee to complete additional course work.

Course work will include 36 hours within the department.

The following courses are required:

- Introduction to Graduate Studies (441)
- Seminar in Qualitative Research Methods (411)
- Seminar in Quantitative Research Methods (402)
- Seminar in Communication Theory (487)
- Rhetorical Criticism (485) or Seminar in Television Criticism (414) and
- Research Practicum (450) (3 hours)

A student may satisfy the foreign language-related field requirement for the PhD in communication by completing, at the post-master's level, two blocks of course work of six semester hours each (in courses at the 200 level and above) that are taken outside the Department of Communication. One block is considered a collateral field representing a coherent unit of study and relates to an area of major research interest. The other block is to be designed as a research tool to provide the student with research skills applicable to the dissertation.

The comprehensive examination, including a 15-hour written exam and an oral defense, will cover all areas of studies in the field.

The doctoral dissertation is written under the direction of the candidate's adviser. The dissertation and the final oral examination on the dissertation complete the requirements for the PhD in communication.

No more than six hours of course work or independent study in television production or scriptwriting will be accepted for the PhD degree. Students may opt to take more production hours, but they will not be accepted toward the candidate's degree program.

COURSES

205—Performance in the Visual Media (3). Basic styles and presentational skills necessary in performing for film and television. Prerequisite: instructor's consent.

206—Advanced Audio Production (3). The study and application of techniques applicable to radio, television, and multimedia production with an emphasis on digital audio workstation systems. Prerequisite: Communication 105.

210—Message Design and Writing for the Media (3). Styles and functions of various script formats for radio, television productions. Prerequisites: 105 or instructor's consent.

241—Nonverbal Communication (3). Analysis of form and content of nonverbal communication. Emphasis on role of nonverbal cues in interpersonal communication. Prerequisite: junior standing or instructor's consent.

261—Relational Communication (3). Analysis of communication influences on relational identities and development. Prerequisite: junior standing or instructor's consent.

270—Culture and Communication (3). (same as Anthropology 270).

271—Group Decision Making Processes (3). (same as Peace Studies 271). Procedures and techniques for interpersonal communication and decision making in small groups. Prerequisite: junior standing or instructor's consent.

275—Business and Professional Communication (3). Principles and practice of speech communication in business and professional settings. Emphasis on interviews, group conferences and personal presentations. Prerequisite: junior standing.

276—Persuasive Speaking (3). Principles, techniques of persuasive speaking. Prerequisites: 75 or instructor's consent.

280—Internship (1-4). Directed professional experience within and outside the University in communication-related fields or organizations. S/U graded only. Prerequisites: Admission to department, junior standing, instructor's consent 2.5 GPA.

290—Television Studio Production (3). Operation of television studio production equipment; processes and procedures of producing and directing. Prerequisites: 105, junio standing and instructor's consent.

295—Television Field Production (3). Theory and practice of TV field production, including preproduction, production with portable equipment and electronic editing. Prerequisite 290, junior standing and instructor's consent.

296—Honors in Communication (2). Special work for Honors candidates in communication.

297—Honors in Communication (2). Special work for Honors candidates in communication.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing and instructor's consent, departmental consent for repetition.

304—Radio-TV Programming and Management (3). Analysis and evaluation of program scheduling, audience research methodologies, and issues related to management of media facility. Prerequisites: junior standing & instructor's consent.

307—Broadcast Regulation and Responsibility (3). Federal, state regulations affecting programming, operating policies of American broadcast stations; administrative authority of Federal Communications Commission; responsibility of broadcast license. Prerequisite: instructor's consent.

308—Television Program Analysis and Criticism (3). Development of critical viewing skills including analysis of program conventions, genres, and television aesthetics. Prerequisites: junior standing and instructor'sconsent.

310—Documentary Film and Video (3). An historical and theoretical overview of the international actuality film from the early work of Flaherty and Grierson through contemporary television documentaries.

312—Gender, Language, and Communication (3). (same as Linguistics and Anthropology 312). Relationship among gender, language, noverbal communication, and culture. Prerequisite: junior standing or departmental consent.

315—Language and Discourse (3). (same as Linguistics 315). Analysis of the rules of social interaction and the functions of language in discourse. Prerequisites: junior standing and departmental consent.

320—Family Communication (3). (same as Human Development and Family Studies 320). Analysis of the functions and processes of communication within families. Prerequi-

site: junior standing or departmental consent.

336—Contemporary Issues in Telecommunications (3). Introduction to current issues and trends and relationship among the new technologies, policies, and potential impact on society. Prerequisites: junior standing and instructor's consent.

337—Gender, Ideology and the Media (3). This course looks at popular media and the issues surrounding its use and production by women. The course also investigates class, race, and other relevant social and cultural aspects of media. Prerequisite: junior standing.

338—New Technologies and Communication (3). Explores the social implications of new technolgies designed for communication. Assumes basic computer knowledge. Prerequisite: junior standing or instructor's consent.

340—Ethical Issues in Communications (3). Exploration and analysis of ethical dimensions intrinsic to human communication. Prerequisite: junior standing or departmental consent.

350—Directed Reading (1-3). Independent reading, reports. Prerequisites: junior standing or instructor's consent.

373—Political Communication (3). Study of role and impact of communication in political campaigns; historical and contemporary study of influence by communication; case studies and practicum. Prerequisite: junior standing or departmental consent.

374—Theory and Research in Persuasion (3). Studies the persuasive process, attitude formation, modification. Prerequisites: 276 and departmental consent.

376—Organizational Communication (3). Theories of communication systems and processes in organizational structures; study of communication behavior in formal and informal organizational settings. Prerequisites: 271 or departmental consent.

377—Senior Project (3). Integration and adaptation of communication theories to an applied communication problem. Required for all majors. Prerequisite: admission to department, senior standing, and departmental consent.

381—Principles of Rhetoric (3). Development of rhetoric from time of Corax with emphasis on Aristotle; derivation, application of standards for judging effectiveness in communication. Prerequisites: 75, junior standing and departmental consent.

395—Professional Seminar in Television Production (3). Application of principles to advanced television production, direction. Prerequisites: 290 and instructor's consent.

400—Problems (1-99). Individual study not leading to thesis or dissertation. Prerequisite: instructor's consent.

401—Topics (1-99). Study of selected topics in Communication. Topic and credit may vary semester to semester. Repeatable upon consent of department. Prerequisite: instructor's consent.

402—Seminar in Quantitative Methods Communication (3). Quantitative methods of speech research. Prerequisite: 441.

403—Seminar in Communication (3). Directed research on selected topics concerning theories of speech communication. May be repeated. Prerequisite: instructor's consent.

404—History and Criticism of Broadcasting (3). Cultural, technical development of broadcasting with emphasis on responsible criticism. Prerequisite: instructor's consent.

407—Seminar in Corporate and Instructional Television (3). Uses, design, production, evaluation, technical aspects and management of educational television. Prerequisite: instructor's consent.

409—Broadcasting and Mass Culture (3). Examines the traditional arguments and literature relevant to broadcasting and mass culture.

410—Studies in Broadcasting (1-6). Directed readings in current philosophical, historical, social, political, economic aspects of broadcasting. Prerequisite: instructor's consent.

411—Seminar in Qualitative Methods in Communication (3). Examination of assumptions and techniques of qualitative methods adopting an interpretive framework for analyzing communication phenomena.

412—Seminar in Organizational Communication (3). Exploration of the theoretical foundations of interpersonal communication in the organization, groups and team development, leadership, organizational decision making, motivation and power, bureaucracy, new information technologies, organizational effectiveness and the change process.

413—Seminar in Small Group Communication (3). Identifies and analyzes theories and variables which explain, predict, and/or influence small group communication.

414—Seminar in Television and Film Criticism (3). Examination and application of various critical methodologies to television and film texts.

415—Seminar in Interpersonal Communication (3). Examines theory and research concerning face-to-face dyadic interactions. Emphasis on context of interpersonal communication events and processes of interactional management.

441—Introduction to Graduate Study in Communication (3). Orientation to the field. Introduction to research methods. Production of research proposal. Emphasizes scholarly style of writing.

450—Research (1-99.9). Independent research of advanced nature leading to report. Prerequisite: instructor's consent.

451—Seminar in Speech Education (3). Directed research on selected problems in instruction and research methods in the field of communication. Prerequisite: instructor's consent. May be repeated.

460—Research Practicum (3). Student conducts research under close supervision of faculty mentor. Goal: produce research report suitable for submission as convention paper, article, or book chapter. Consent of mentor required. Advanced graduate students. May be repeated once for credit.

483—Rhetorical Theory (3). Examines rhetorical theory from classical Greece through contemporary theorists. Emphasizes classical, eighteenth century British, and contemporary periods.

485—Rhetorical Criticism (3). Principles, practice criticism (description, analysis, evaluation) of rhetorical artifacts.

486—Seminar in Theories of Rhetoric and Criticism (1-6). Directed research on selected topics in rhetorical theory and criticism. Prerequisite: instructor's consent. f,s.

487—Seminar in Communication Theory (3). Examines the nature of theory, the assumptions underlying theoretical approaches to communication, and surveys themes in contemporary communication theories.

490—Research (1-99.9). Research leading to thesis or dissertation. Prerequisite: instructor's consent. Graded on a S/U basis only.

Communication Science and Disorders

School of Health Related Professions
303 Lewis Hall (573) 882-3873

FACULTY

Philip S. Dale, chair, professor, PhD, University of Michigan. Language Science.

Martha M. Parnell, director of graduate studies, associate professor, PhD, University of Missouri-Columbia. Speech-language pathology.

James D. Amerman, professor, PhD, University of Illinois. Speech science.

Jon L. Deal, clinical associate professor, PhD, University of Southern Mississippi. Speech-language pathology.

Judith C. Goodman, associate professor, PhD, University of Chicago. Language science.

Linda S. Day, assistant professor, PhD, University of Missouri-Columbia. Speech-language pathology, language science.

Sherri Jones, clinical assistant professor, PhD, University of Nebraska. Audiology.

Linda S. Larrivee, assistant professor, PhD, University of Kansas. Speech-language pathology.

Lyanne Riley, clinical assistant professor, PhD, University of Missouri-Columbia. Speech-language pathology.

Barbara Brinkman, clinical instructor, MA, University of Colorado. Speech-language pathology.

Barbara McLay, clinical instructor, MA, University of Iowa. Audiology.

DEGREE: MHS in communication science and disorders, with an emphasis area in speech-language pathology

COOPERATIVE DEGREE: PhD in cooperation with the Department of Communication, with an emphasis area in speech-language pathology/audiology

The Department of Communication Science and Disorders offers graduate work leading to the degrees of master of health science and doctor of philosophy in speech-language pathology/audiology. The master's degree prepares students for national certification in speech-language pathology and for professional clinical practice in both health care and educational settings. The doctoral degree involves a program of research and advanced study beyond the clinical master's degree in preparation for a career in research and college teaching or administration.

The department uses many cooperative facilities in Columbia, both on and off the MU campus, as clinical and scientific resources. Among these are the University Hospitals and Clinics, Rusk Rehabilitation Center, Ellis Fischel Cancer Center, Truman Veterans Hospital, Mid-Missouri Mental Health Center and Columbia Public Schools. Other cooperative facilities are available in nearby communities. The department operates the MU Speech and Hearing Clinic, a diagnostic and treatment center serving individuals with communicative disorders from the campus and the community. In addition, the department maintains its own laboratory with sophisticated equipment for research and clinical evaluation in normal and disordered speech, language and hearing.

The MU master's degree program in speech-language pathology has been continuously accredited by the American Speech-Language-Hearing Association Standards Board since 1965. An active local chapter of the National Student Speech-Language-Hearing Association is sponsored by the program.

Graduate students are eligible to apply for scholarships, fellowships, work-study grants, traineeships and graduate teaching assistantships.

MASTER'S DEGREE: Acceptance for admission to master's level study is determined by a selection committee. To be considered for admission, students must submit:

- official transcripts of all college course work (a minimum 3.0 GPA [A=4.0] for the last 60 hours of college work is required),
- GRE general test scores (Successful applicants typically have combined scores on the

Verbal and Quantitative subtests of 1000 or above.),
- TOEFL and TSE scores if English is not the applicant's first language (students must present a TOEFL score of 600 or above on the paper-based test, 250 or above on the computer-based test and a TSE score of 60 to be considered for admission),
- three letters of recommendation,
- a letter of purpose, indicating goals, timetable, etc. and
- personal interviews may be requested.

Students admitted to the MHS program must complete, at MU or elsewhere, the requirements for an undergraduate major in speech-language pathology before beginning master's course work. MHS candidates are required to complete a minimum of 42 semester hours in graduate-level courses with grades of B or higher. No fewer than 24 hours must be earned in 400-level course work offered by the program. A maximum of 10 hours in clinical practicum courses may be counted toward the 42-hour requirement. A thesis is optional for the master's degree, but students are expected to complete at least one major research project during their degree program.

During the final semester of course work, master's degree candidates must achieve a passing score on the National Examination in Speech-Language Pathology. This exam serves as the comprehensive examination for the degree.

DOCTORAL DEGREE: Acceptance for admission to doctoral studies is determined by a selection committee. For consideration for admission to the doctoral program in speech-language pathology, students must submit the information listed above for master's applicants **and**:
- a statement of interest, detailing the student's research interests and professional goals.
- a substantial sample of the student's scholarly written work (a thesis or term papers).
- personal interviews may be requested.

To be considered for admission to doctoral studies in speech-language pathology, students must have achieved a GPA of at least 3.4 (A=4.0) on the most recent 60 hours of college/university course work. Successful applicants typically have combined Verbal and Quantitative GRE scores of well above 1000. Only those students who show clear likelihood for success in doctoral-level studies and research are admitted. Students who are admitted must pass a qualifying examination, complete a minimum of 60 credit hours beyond the master's degree (typically, 12 hours of research design and statistics, 12 hours of outside area course work, 21 hours of communication science and disorders course work, and research credit hours to bring the total to 60), pass written and oral comprehensive examinations, and successfully complete and defend a dissertation. Each individual doctoral studies program is designed in consultation with the student's major adviser and must be approved by an advisory committee.

For more specific information about the master's or doctoral program, write the Director of Graduate Studies, Communication Science and Disorders Department, 303 Lewis Hall, Columbia, MO 65211.

COURSES

200—Research Apprenticeship (1-99). Research apprenticeship with a faulty member, assisting in the development and execution of research in communication processes and disorders. May be repeated to 6 hrs. maximum. Prerequisite: instructor's consent.

201—American Phonetics (3). (Same as Linguistics 202). Analysis of sounds of Midwestern American dialect. Standards of pronunciation, feature analysis transcription, articulation mechanics, coarticulation.

202—Normal Language Development (3). (same as Psychology 202). Language development in preschool and school-age children. Specific attention to cognition and language, developmental sequences, language learning processes, language sample analysis, and the relationship between spoken and written language. Prerequisites: Linguistics 340 (prefered) or instructor's consent.

210—Anatomy and Physiology of the Speech Mechanism (3). (same as Linguistics 212). Introduction to anatomical and functional aspects of the speech mechanism.

230—Hearing Science (3). Anatomy and physiology of the auditory and vestibular systems in health & disease. Also includes acoustics, measurement of sound, and psychoacoustics. CSD majors or instructor's consent.

243—Applied Neurophysiology for Allied Health Students (3). (same as Physical Therapy 243PT and Occupational Therapy 243OT). Principles of basic neurophysiology, emphasizing correlation of structure and function of the nervous system.

301—Topics in Communicative Disorders (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with program consent. Prerequisites: junior standing and instructor's consent.

302—Language Disorders in Children (3). Overview of language disorders from early childhood through adolescence. Includes language disorders as primary disability and as secondary to other disabilities. Introduction to assessment and intervention. Prerequisites: 120, 202, Linguistics 340. CSD majors only.

303CD—Language Disorders of Adults (2). Introduction to disorders of language that occur in the adult population. Basic review of neuroanatomy/physiology, etiologies, symptomatology. Major emphasis will be placed on assessment and treatment. Prerequisites: 120, 202, and Linguistics 340, or instructor's consent. CSD majors only.

320—Disorders of Phonology and Articulation (3). Overview of disorders of use and production of speech sounds with an emphasis on developmental disorders. Introduction to assessment and treatment. Prerequisites: 120, 201, 202, 210. CSD majors only.

321CD—Fluency and Voice Disorders (2). Investigation of fluency and voice disorders in children and adults with particular attention to identification procedures and clinical management techniques. Prerequisite: 120CD, 210CD. CSD majors only.

325CD—Clinical Observation in Communicative Disorders (1). Directed clinical observations designed to prepare the student for clinical practicum. Repeated for a total of 2 credit hours Graded on a S/U basis only. Prerequisite: senior standing and departmental consent. CSD majors only.

330—Introduction to Audiology (3). Tests and techniques in the evaluation and diagnosis of auditory and vestibular disorders. CSD majors only. Prerequisites: CSD 230 or instructor's consent.

342—Reading and Language Disabilities in School-Age Children (3). Theories, research, and practice in reading development and disorders. Focus on reading disabilities related to language disorders of various etiologies including developmental language disorders and head injury. Assessment, remediation, teaching methods.

350—Directed Reading (1-3). Independent reading; reports. Prerequisite: instructor's consent.

381—Psycholinguistics (3). (same as Linguistics 381). Examines the knowledge and processes that underlie the human ability to produce and understand language. Prerequisite: senior or graduate standing.

382—Speech Perception (3). (same as Linguistics 382). Selected topics in the perceptual processing of spoken language. Prerequisite: senior or graduate standing.

400—Problems in Communicative Disorders (1-99). Individual study not leading to thesis or dissertation. Prerequisite: instructor's consent.

401—Topics in Communicative Disorders (1-99). Study of selected topics in speech pathology/audiology. Topic and credit may vary from semester to semester. Prerequisites: instructor's consent, instructor's and departmental consent for repetition.

402—Developmental Language Disorders (3). Nature, etiology, assessment and management of childhood language disorders. Prerequisites: 202, 302 and Linguistics 340 or equivalent, or instructor's consent.

403—Acquired Language Disorders (3). Primary emphasis on etiology, symptomatology, assessment and management of acquired aphasia in adults. Also addressed are the communicative deficits associated with traumatic brain injury, right hemisphere damage, and dementia. Prerequisites: 202, 303, and Linguistics 319 or equivalent, or instructor's consent.

411—Speech Physiology (3). Analysis of physiological features associated with speech subsystems; theories of encoding with special emphasis on speech motor control mechanisms. Prerequisites: 201 and 210 or instructor's consent.

412—Speech Acoustics (3). Analysis of acoustic and perceptual characteristics of speech including computer-based acoustical processing techniques. Prerequisites: 201 and 210 or instructor's consent.

420—Motor Speech Disorders (3). A systematic study of disorders of motor speech control (dysarthria, apraxia) which result from damage to the human nervous system. Emphasis on etiology, symtolatology, assessment and treatment. Prerequisites: 310 and 320 or instructor's consent.

421—Fluency Disorders (2). Identification and remediation of fluency disorders in children and adults. Prerequisites: 210, 220, 321, or equivalent or instructor's consent.

422—Voice and Cleft Palate (2). Diagnosis and management of communicative disorders resulting from pathologies or abnormalities of the craniofacial structures and from patholgies or misuse of the phonatory systems. Prerequisites: 210 320 and 321 or instructor's consent.

423—Dysphagia (2). Diagnosis and treatment of swallowing disorders, including video-fluoroscopic analysis. Emphasis is on acquired dysphagia in adults, but developmental dysphagia is also addressed. Prerequisites: 210, 321, 420 or instructor's consent.

425—Clinical Practice in Speech Pathology (2-3). Supervised clinical practice in speech pathology for graduate students. May be repeated for credit. Prerequisite: 325 or equivalent.

426—Diagnosis in Speech-Language Pathology (3). General principles of diagnosis; specific diagnostic tools and procedures for various speech and language disorders. Prerequisite: departmental consent.

434—Aural Rehabilitation (3). Identification, evaluation, and management of problems associated with hearing impairment in both children and adults. Includes issues related to speech/language development, communication, education, and social factors. Prerequisites: 230 and 330. Supervised integrated with diagnostic and rehabilitation programs. May be repeated for credit. Prerequisite: 330.

435—Clinical Practice in Audiology (1-3). Supervised integrated with diagnostic and rehabilitation programs. May be repeated for credit. Prerequsite: 330.

450—Research in Communicative Disorders (1-99). Independent research leading to a report but not to a thesis or dissertation. Prerequisite: instructor's consent.

460—Seminar: Contemporary Topics in Speech-Language Pathology (1-3). Advanced study involving critical literature review and research on selected topics in speech and language. May be repeated for up to 6 credits. Prerequisite: instructor's consent.

461—Seminar: Contemporary Topics in Audiology (1-3). Advanced study and review of research on special topics in Audiology. May be repeated for up to 6 credits. Prerequisite: instructor's consent.

490—Research in Communicative Disorders (1-99). Research leading to thesis or dissertation. Prerequisite: instructor's consent. Graded on a S/U basis only.

Computer Engineering and Computer Science

College of Engineering
201 Engineering Building West
(573) 882-3842

FACULTY

Su-Shing Chen, chair, professor, PhD, University of Maryland.

Harry Tyrer, associate chair, professor, PhD, Duke University.

Gordon K. Springer, director of graduate studies, associate professor, PhD, The Pennsylvania State University.

James Keller, professor, PhD, University of Missouri-Columbia.

Otho R. Plummer, professor, PhD, University of Texas at Austin.

Frederick N. Springsteel, professor, PhD, University of Washington.

Xinhua Zhuang, professor, PhD, Peking University, China.

Paul Gader, associate professor, PhD, University of Florida.

Youran Lan, associate professor, PhD, Michigan State University.

Kannappan Palaniappan, associate professor, PhD, University of Illinois.

Youssef G. Saab, associate professor, PhD, University of Illinois.

Yunxin Zhao, associate professor, PhD, University of Washington.

Michael Jurczyk, assistant professor, PhD, University of Stuttgart, Germany.

Yi Shang, assistant professor, PhD, University of Illinois.

Hongchi Shi, assistant professor, PhD, University of Florida.

Marjorie Skubic, assistant professor, PhD, Texas A&M University.

DEGREES: MS in computer science, MS in computer engineering, PhD in computer engineering and computer science

The graduate degree programs in computer engineering and computer science (CECS) provide a variety of opportunities for students to gain advanced training in a highly dynamic field. Master's students are prepared for further study at the doctoral level or for careers as computer professionals. The Ph.D. program is designed to prepare the student for advanced professional careers in research and university teaching.

Faculty research covers a wide range of interests including artificial and computational intelligence, computational complexity and automata, computer graphics and scientific visualization, computer vision, computer networking, database theory and design, digital libraries, fuzzy logic, high speed networking systems and applications, multimedia systems, operating systems, parallel and distributed computing, software engineering, software system design, wireless computing, and world-wide-web programming.

A wide range of computing and networking resources are available to the students in the department, the college and the campus. These resources provide ready access to state-of-the-art computing systems and networking facilities ranging from small desktop systems to large computational systems that are interconnected by traditional and advanced networking facilities. These connections also provide links to the commodity Internet and the vBNS/Internet2 networks for global access to information, software, machines and colleagues. All of these facilities provide a wealth of opportunity for students to use and study state-of-the-art computing and networking.

Graduate application deadlines: All applications for admission must be received by the department by March 1st and all paperwork received by April 15th for the fall semester. Applications must be received September 1st and all paperwork received by October 15th for the winter semester. The director of graduate studies may admit outstanding candidates at other times.

All applicants must submit a written statement of purpose describing the applicant's computer related background, career goals and areas of technical interest, three letters of recommendation from professors who know your abilities, official transcripts from all institutions attended and scores from the GRE general test. International students must also submit scores from a TOEFL exam. These materials will be evaluated by the department. While a bachelor's degree from an accredited institution is required, the undergraduate major need not be computer science or computer engineering as long as the applicant has had sufficient mathematics, computer science and/or computer engineering training to qualify for 400-level courses during the first three semesters of graduate work.

MASTER OF SCIENCE IN COMPUTER ENGINEERING OR COMPUTER SCIENCE: To be admitted to the master's program the student must:

- have proficiency in a procedural programming language (preferably C) equivalent to CECS 103 and 203 (algorithm design and programming including formal data structures);
- knowledge of computer system architecture equivalent to that contained in CECS 126 (introduction to digital systems) and 226 (logic design) or 227 (digital logic and computer design);
- three semesters of calculus equivalent to Math 80, 175, and 201 at MU;
- an additional course in mathematics for which Math 201 is a prerequisite;
- knowledge of discrete mathematical structures equivalent to Math 226; and
- a 3.0 (4.0=A) GPA in the last half of the undergraduate curriculum;
- acceptable scores on the GRE general test's three parts;
- a TOEFL score above 575 and a Superior Test of Written English score (usually above 4.0/6.0) for students not schooled in English as their native language.

Applicants for the CE program must have completed equivalents to two of the following courses prior to admission: CECS 326, 327, 332, or 352. CS applicants must have completed equivalents to two of the following courses: CECS 303, 332, 341, or 352.

All students completing a Master's degree must fulfill the following minimum requirements. Earn 30 credit hours of course work approved by the CECS department (they must include at least 15 hours of 400-level courses including research or non-thesis project credit). Students who do not have all four of the "two out of four" courses required for admission must complete the remaining specified courses during their MS program (courses taken to complete this requirement will count toward the required 30 hours). A GPA of 3.0/4.0 for all graduate level work attempted is required. The student must complete at least two sequences of courses numbered 300+/400+. Courses from other departments will be considered for approval as part of a student's MS degree program provided these courses are germane to the student's MS program and the approval is sought before the course is undertaken. The student must complete and defend a research paper required in the non-thesis option (CECS 491) or a project thesis required in the thesis option (CECS 490).

PhD IN COMPUTER ENGINEERING AND COMPUTER SCIENCE: Admission for advisement into the PhD program requires the completion of the equivalent of an MS degree in CE or CS with an overall graduate GPA of 3.4/4.0. At the discretion of the graduate committee, highly qualified students may be admitted directly into the PhD program without fulfilling this requirement.

All students completing a PhD degree must fulfill the following minimum requirements. The student must:

- complete all the course work requirements of the Master's degree in CE or CS or have an MS degree in CE or CS from another institution (excluding research and problems courses);
- pass a qualifying examination;
- earn a minimum of 72 credit hours of course work and research past the student's BS degree;
- pass a comprehensive examination covering their areas of expertise;
- complete a doctoral dissertation on a topic approved by the candidate's advisory committee; and
- defend the dissertation in a final oral examination.

DUAL MASTER'S DEGREES: A student may earn two master's degrees simultaneously by satisfying the requirements of the two master's degrees in the two participating programs (the

requirements must include a minimum of 15 hours at the 400 level in both programs and complete a thesis or project for each program or a shared thesis or project upon the agreement of both participating degree programs.

Fellowships, scholarships, and teaching and research assistantships are available to qualified students. Applications must be received by March 1. Additional information, including applications for financial support and information about specific GRE and TOEFL exam score requirements, can be obtained from the Director of Graduate Studies, Department of Computer Engineering and Computer Science, 201 Engineering Building West, Columbia, MO 65211-2060.

COURSES

201—Topics (1-99). Topic and credit may vary from semester to semester. May be repeated upon consent of department. Prerequisite: departmental consent.

203—Algorithm Design and Programming II (3). A study of fundamental techniques and algorithms for representing and manipulating data structures using a procedural language. Topics include data abstraction, recursion, stacks, queues, pointers, linked lists, trees and efficient methods of sorting and searching. Prerequisite: CECS 103.

207—Programming Languages (1-3). The study of the syntax, semantics, and applications of a programming language. The language offered varies from semester to semester. May be taken more than once for credit. Prerequisite: departmental consent. f,w.

211—Production Languages (3). The study of the syntax, semantics, and applications of one programming language suitable for large scale scientific or commercial projects such as FORTRAN, COBOL, PL/1, C, or ADA. May be taken more than once for credit. Prerequisite: CECS 203. f,w,s.

226—Logic Design (4). (same as Electrical Engineering 226). Digital electronics, chip level logic design, algorithmic state machines, microprocessor architecture and interfacing and digital system design methodology. Includes one hour laboratory. Prerequisite: CECS 126.

227—Digital Logic and Computer Design (3). Basic tools, methods and procedures to design combinational and sequential digital circuits and systems. Accumulator and register type ALUs, wired and microprogrammed control units, memories, I/O devices and interfacing, bus and control. Prerequisites: CECS 126. f.

231—Systems Analysis I (3). An introduction to the analysis and design of information systems. Presents an overview of information systems, emphasizes the fundamental concepts of a systems development life cycle, and offers experience with modeling tools and techniques used in systems analysis. Prerequisites: CECS 203. f,w.

233—Object Oriented Programming (3). Building on a prior knowledge of C and data structures, this course covers C++ and object-oriented design, including classes, objects, inheritance, polymorphism and information hiding. Students will apply techniques using C++. Prerequisite: CECS 203 or 211 - C.

235—File Processing (3). Practical aspects of the application programming environment, with emphasis on file structures, file processing and access methods, use of secondary storage devices, job control language, and use of system utility and support programs. Prerequisites: CECS 203. f,w

253—UNIX Operating System (3). Introduction to the UNIX operating system and its interfaces including the file system, shell, editors, pipes and filters, input/output system, shell programming, program development including C, and document preparation. Prerequisite: CECS 203 or 211 - C

280—Internship in Computer Science (1-3). Computer-related experience in business or industry jointly supervised by faculty and computer professionals. Students should apply one semester in advance for consent of the supervising professor. Prerequisites: departmental consent. Graded on a S/U basis only. f,w,s

283—Introduction to the Internet, WWW and Multimedia Systems (3). This course will attempt to provide a comprehensive understanding of the evolution, the technologies, and the tools of the Internet. In particular, issues pertaining to the World Wide Web and Multimedia (HTML, CGI, Web based applications) will be discussed in detail. Prerequisites: CECS 203 or instructor's consent.

296—Computer Science and Computer Engineering Projects Lab (2). Open ended design projects which encourage innovative solutions to design modern computer and information systems. Students will complete projects from different areas. Special emphasis on written and oral presentation and practical programming experience.

300—Problems (1-99).

301—Topics (1-99). Topic and credit may vary from semester to semester. May be repeated upon consent of department. Prerequisite: departmental consent.

303—Design and Analysis of Algorithms I (3). This course reviews and extends earlier work with linked structures, sorting and searching algorithms, and recursion. Graph algorithms, string matching, combinatorial search, geometrical algorithms and related topics are also studied. Prerequisite: CECS 203 and Mathematics 226. w.

307—Numerical Analysis (3). (same as Mathematics 307). Machine arithmetic, approximation and interpolation, numerical differentiation and integration, nonlinear equations, linear system, differential equations, error analysis. Selected algorithms will be programmed for solution on computers. Prerequisites: Math 201 and the ability to program in a high-level language such as Fortran, Pascal or C.

308—Numerical Linear Algebra (3). (same as Mathematics 308).

326—Microcomputer Architecture and Interfacing (4). (same as Electrical Engineering 326). Advanced microprocessor architecture and programming; special interface devices, such as memory controllers, disk controller, I/O processors, terminal controllers, communication interfaces and coprocessors. Prerequisite: CECS 226.

327—Computer Architecture I (3). Architectural features of high-performance computer systems including hierarchical and virtual memory, pipelining, vector processing and an introduction to multiple-processor systems. Prerequisites: CECS 226 or 227.

328—Design of Digital Subsystems (3). (same as Electrical Engineering 328). Design techniques including module definition, functional partitioning, hardware design language descriptions and microprogramming; design examples include arithmetic units, programmable controllers, and microprocessors. Prerequisite: CECS 226.

331—Systems Analysis II (3). Advanced theory and practice of systems analysis. Including data-flow analysis, structured and data-oriented methodologies, project management, measurement and estimation, peer reviews, quality assurance, and system acquisition. Team projects involving real clients provide guided experience. Prerequisite: CECS 231. f,w

332—Software Engineering I (3). Overview of software life cycle processes. Practical and theoretical topics including systems analysis and requirement specification, software design, implementation testing and maintenance. Prerequisite: CECS 231 or departmental consent. f.

333—Object Oriented Design I (3). Building on a prior knowledge of program design and data structures, this course covers object-oriented design, including classes, objects, inheritance, polymorphism, and information hiding. Students will apply techniques using a modern object-oriented implementation language. Prerequisite: CECS 303, 233.

338—Database Management Systems I (3). Fundamental concepts of current database systems with emphasis on the relational data model. Other topics include the network and hierarchical data models, entity-relationship design, and case studies. Project work involves a modern DBMS using SQL. Prerequisite: CECS 231. f,w

341—Theory of Computation I (3). An introductory study of computation and formal languages by means of automata and related grammars. The theory and applications of finite automata, regular expressions, context- free grammars, pushdown automata and Turing machines are examined. Prerequisite: CECS 126 and Math 226. f,w

343—Compilers I (3). Introduction to the translation of programming languages by means of interpreters and compilers. Lexical analysis, syntax specification, parsing, error-recovery, syntax-directed translation, semantic analysis, symbol tables for block- structured languages, and run-time storage organization. Prerequisite: CECS 126 and Math 226. w

345—Principles of Programming Languages (3). An introduction to the structure, design and implementation of programming languages. Topics include syntax, semantics, data types, control structures, parameter passing, run-time structures, and functional and logic programming. Prerequisite: CECS 203.

349—Applied Modern Algebra (3). (same as Mathematics 349).

350—Special Readings (1-3).

352—Operating Systems I (3). The hardware, firmware and software organization of computer systems; basic operating system concepts, concurrent processes, CPU and disk scheduling, memory management, deadlocks, systems evaluation and simulation, and performance measurement. Prerequisites: CECS 303 and either CECS 226 or 227.

354—Systems Programming for Microcomptures (3). An introduction to systems programming for IBM microcomputers. Includes assembly language programming, techniques for I/O devices such as printers, serial ports, keyboards and video displays. The development and coding of an operating system is studied. (Not available for graduate credit in Computer Science). Prerequisite: CECS 126.

361—Computer Graphics I (3). Basic concepts and techniques of interactive computer graphics including hardware, software, data structures, mathematical manipulation of graphical objects, the user interface, and fundamental implementation algorithms. Prerequisites: CECS 303 and Mathematics 175. f

365—Image Processing (4). Fundamentals of digital image processing hardware and software including digital image acquisition, image display, image enhancement, image transforms and segmentation. Prerequisites: CECS 303, Statistics 320 or instructor's consent.

366—Multimedia Engineering and Technology (3). (same as Electrical Engineering 317). Survey of multimedia applications. Capture, coding, storage, transmission and software tools for developing productions involving text, graphics, images, animation, sound and video. Term Projects. Lecture and laboratory. 4 credits. Prerequisites: EE 226 Logic Design and EE 216 Linear Systems and Circuits.

371—Expert Systems (3). (same as Sociology, Veterinary Medicine & Surgery and Anthropology 321). Introduction to the use of expert system shells, designed for graduate students from any department. Students create prototype expert systems under close supervision by faculty experts. Prerequisite: departmental consent.

373—Building Intelligent Agents (3). Introduction to the design and development of intelligent agents, particularly emphasizing topics related to sensor-based control of mobile agents. Includes sensor characterzation, mechanics of mobile robot control, reactive behaviors, and intelligent control architectures. Prerequisites: senior or graduate standing. CECS 203 or equivalent.

375—Artificial Intelligence I (3). Introduction to the con-

cepts and theories of intelligent systems. Various approaches to creating intelligent systems, including symbolic and computational approaches, insight into the philosophical debates important to understanding AI. Prerequisite: CECS 303.

381—Computer Networks I (3). Introduction to concepts and terminology of data communications and computer networking. Basic protocols and standards, applications of networking, routing algorithms, congestion avoidance, long-haul and local networks. Prerequisite: CECS 126 and Mathematics 226. w

383—Science and Engineering of the World Wide Web (3). This course will study the science and engineering of the World Wide Web. We will study the languages, protocols, services and tools that enable the web. Emphasis will be placed on basics and technologies.

398—Senior Capstone Design I (2). (same as Electrical Engineering 398). Group design projects. Design methodology, project management, development of specifications, examination of alternatives, preparation of proposal. Oral and written reports. Not for graduate credit. Prerequisites: concurrent enrollment in a 300-level design course, senior standing.

399—Senior Capstone Design II (2). (same as Electrical Engineering 399). Completion of CECS 398 design project. Design prototyping, testing, evaluation and preparation of documentation. Lectures on ethics, professionalism, safety, economic considerations. Oral and written reports. Not for graduate credit. Prerequisite: CECS 398.

400—Problems (1-3).

401—Topics (1-99). Topic and credit may vary from semester to semester. May be repeated upon consent of department. Prerequisite: departmental consent.

403—Design and Analysis of Algorithms II (3). Techniques for the design and analysis of correct, efficient algorithms. Topics include graph, geometric, and algebraic/numeric algorithms, NP-completeness, and parallel algorithms. Prerequisite: CECS 303. f

409—Computational Geometry (3). Studies fundamental geometric problems within the framework of analysis of algorithms: convex hull algorithms in the plane and in general dimension, Voronoi diagram construction and applications to the solution of proximity problems, intersection problems, and geometric searching problems. Prerequisites: CECS 303 and Mathematics 201, or approval of the instructor. f.

410—Seminar (1). Reviews of recent investigations, projects of major importance. Prerequisite: graduate standing.

427—Computer Architecture II (3). Study of array processors, multiprocessors, multicomputers, and networked computing systems. Topics include architectures, interconnection networks, communication mechanisms, distributed memories and security. Introduction to parallel algorithm design. Prerequisites: CECS 326 or 327.

428—Digital Hardware Systems Design (3). (same as Electrical Engineering 428). Characteristics and parameters of various hardware subsystems, including main memory, auxiliary memory, arithmetic units, card equipment, etc., and principles of organization into efficient system. Prerequisite: CECS 328.

432—Software Engineering II (3). Further discussion of software development methodology. Prerequisite: CECS 332.

433—Object Oriented Design II (3). Software system design using classes and their properties of abstraction, inheritance, dynamic binding, and polymorphism. Focus on object-oriented design of systems such as windows, graphics systems, and operating system. Prerequisite: CECS 333.

438—Database Management Systems II (3). Further study in the theory, design, organization and implementation of databases and database management systems. Topics include: object-oriented databases; distributed databases; system performance issues; security and management; data mining and data warehousing; multimedia databases. Prerequisite: CECS 338.

439—Information Storage and Retrieval (3). Theory and techniques for the organization, storage and retrieval of data. Covers automatic indexing, text processing techniques and file organization techniques. Comparisons of typical commercial and special purpose systems. Prerequisite: CECS 203 and CECS 212.

441—Theory of Computation II (3). An advanced study of computational and formal languages by means of automata and related grammars. Turing machines, decidability, computability, computational complexity, language translation, and recent trends in automata theory. Prerequisite: 341. f.

442—Computability and Recursive Functions (3). Rigorous analysis of the concept of an algorithm given in terms of recursive functions, Turing machines and Post systems. The halting problem and Post correspondence problem are shown to be undecidable.

443—Compilers II (3). Further study of the compilation process. Compiler generation tools, parsing methods, code generation, data-flow analysis, code optimization, error handling, discussion of programming language features and their relationship to the compilation process. Prerequisite: CECS 212, 343.f.

452—Operating Systems II (3). Discusses concurrent processes, distributed/network operating systems; models of processor scheduling, memory management and resource allocation, performance measurement, evaluation and simulation methodology; queuing models; security and reliability. Prerequisites: CECS 352. w.

461—Computer Graphics II (3). Further study of computer graphics, focused on 3-D graphics, transformations, geometric and surface modeling, color models, visible surface determination, lighting and shading, standard graphics software (Phigs/OpenGL). Selected current topics in graphics such as visualization, animation and realism. Prerequisite: CECS 361.

467—Digital Image Compression (3). Covers digital image formation, information theory concepts, and fundamental lossless and lossy image compression techniques including bit plane encoding, predictive coding, transform coding, block truncation coding, vector quantization, subband coding and hierarchical coding. Prerequisite: EE 307 or CECS 365.

469—Computer Vision (3). Principles of computer (robot) vision, including image perception, object representation, stereo analysis, pose, shape and motion estimation. Prerequisite: CECS 365 or instructor's consent.

475—Artificial Intelligence II (3). Further discussion of theories and techniques of artificial intelligence. Advanced programming in LISP and Prolog and introduction to the use of A.I. workstations. Prerequisites: CECS 375.

476—Pattern Recognition (3). Decision functions, crisp and fuzzy clustering methods, statistical pattern recognition methods, Bayesian classifiers, error probabilities, estimation of density functions, perceptrons, least-mean-square algorithms, feature selection, dimensionality reduction and syntactic pattern recognition. Prerequisites CECS 303, Statistics 320.

477—Neural Networks (3). The course will consider computing systems based on neural networks and learning models along with implementations and applications of such systems. Prerequisites: CECS 303, Statistics 320.

478—Modeling and Management of Uncertainty (3). Theoretical and practical issues in the modeling and management of uncertainty. Topics include probabilistic uncertainty, belief theory and fuzzy set theory. Applications to computer vision, pattern recognition and expert systems. Prerequisites: CECS 303, Statistics 320.

481—Computer Networks II (3). In-depth analysis and evaluation of computer networking architectures, protocols and algorithms, network security, distributed database and computational networks, routing and congestion control, domains and internetworking. Prerequisite: CECS 381. f

482—System Modeling (3). System performance requires the assessment of its delay and throughput. Markov theory provides the theoretical basis for such assessment. More general methods describe queues including open and closed queuing networks. Includes performance assessment of computer processors. Prerequisite: Statistics 320 or instructor's consent.

486—Parallel and Distributed Processing (3). This course covers basic issues of parallel and distributed processing, including parallel and distributed architectures and models, parallel programming, and parallel algorithms and applications. Prerequisites: CECS 303.

490—Research (1-99). Prerequisite: advisor's consent. Graded on S/U basis only.

491—Research (non-thesis project) (1-99.9). Investigation and research of a topic, not leading to a thesis. Prereq-uisite: departmental consent.

Consumer and Family Economics

College of Human Environmental Sciences
239 Stanley Hall (573) 882-7836

FACULTY

Edward J. Metzen, chair, professor, EdD, University of Missouri-Columbia.

Craig L. Israelsen, associate professor, PhD, Brigham Young University.

Eunice Lieurance, associate professor emerita, MS, Michigan State University.

Robert O. Weagley, associate professor, PhD, Cornell University.

Anna Cathryn Yost, associate professor emerita, MS, Purdue University.

Melchior J. Zelenak, associate professor, PhD, University of Iowa.

Joyce Cavanagh, assistant professor, PhD, University of Missouri-Columbia.

Micheal Finke, assistant professor, PhD, The Ohio State University.

Deanna L. Sharpe, assistant professor, PhD, Iowa State University.

DEGREES: MS in consumer and family economics and PhD in human environmental sciences with emphasis area in consumer and family economics

Both the MS and PhD programs encompass a broad, but integrated, array of dimensions of consumer and family economics. The focus includes household and consumer economic conditions and behavior, economic and social policy, and the interrelationships among those elements. Students' programs capitalize upon competencies and professional interests through selection of courses and independent study to supplement the focus of the program (economic theory, consumer behavior and marketing, finance, family development, demographics, political science and mass communication media). Preparation may include research, teaching or internship experiences in addition to program requirements.

The MS degree prepares students for college teaching, consumer affairs positions, social service agencies, extension or other adult education programs, financial services institutions, consumer journalism and other positions in business, public sector and not-for-profit institu-

tions. The PhD degree qualifies students for teaching and research at the university level and for other research or administrative positions.

See **Human Environmental Sciences** for general information.

For additional information write the Director of Graduate Studies in Consumer and Family Economics, 239 Stanley Hall, Columbia, MO 65211.

COURSES

283—Financial Planning: Computer Applications (3). Development of expertise in analyzing family financial case situations via applications of the mathematics of finance, utilizing computer spreadsheets and family financial management software. Prerequisites: 183; Ag 111 or Computer Science 75.

300—Problems (1-99). Supervised and independent work. Prerequisites: a 100- or 200-level course in field of problem & senior standing & instructor's consent.

318—Topics (1-99). Selected current topics in field of interest. Prerequisites: vary with topic.

350—Readings (1-99). Prerequisite: 2-3 hours in subject.

355—Recent Trends (1-3). For upper-class and graduate students who wish additional knowledge and understanding in specific subject matter areas. Prerequisites: varies with the topic.

380—Family Ecology (3). Examination of family economic and lifestyle trends. Consideration of impact of personal and family values, technology, macroeconomy, mass media, social movements on family resource allocation. Prerequisites: CFE 180 and junior standing or above.

382—Financial Planning: Risk Management (3). Analysis of family financial risks and conservation of family assets via risk management, with primary focus on personal lines of insurance. Prerequisites: CFE 283; 5-6 credits of economics; Statistics 31 or 150.

383—Financial Planning: Investment Management (3). Management of family financial investments. Prerequisites: CFE 283; 5-6 credits of Economics; Statistics 31 or 150.

384—Financial Planning: Real Estate (3). Family housing and real estate investments as components of the family's quality of life and asset portfolio. Prerequisites: CFE 283; 5-6 credits of Economics, Statistics 31 or 150.

385—The Consumer and the Market (3). Economic systems and role of consumers; marketing practices; consumer behavior, problems, legislation. (No credit for students who have completed 185.) Prerequisites: graduate standing, Introductory Economics course.

386—Financial Planning: Employee Benefits and Retirement Planning (3). Fundamentals of employee benefits and retirement planning. Consideration of options via government, employer, financial markets. Special circumstances of women, part-time, and contingent workers considered. Prerequisites: 382, 383, or consent.

387—Consumer and Household Economics (3). Consumption as an economic activity; theory of consumer choice; economic policies affecting consumer interests; introduction to household production theory. Prerequisites: Economics 251; Statistics 31 or 150.

388—Effective Consumer Decision-Making (3). Theory, concepts, principles underlying consumer decision-making, including rationality, uncertainty, optimal search, heuristics, interactive decisions; strategies for their application in the marketplace. Prerequisites: 185 or 385; 5-6 credits of Economics.

389—Consumer Protection and Policy Issues (3). Analysis of significant current consumer issues with focus on consumer rights and responsibilities; consumer protection philosophy, laws and regulations. Prerequisites: 185 or 385 Management 254.

390—Internship (1-99.9). Prerequisites: junior standing & instructor's consent.

393—Financial Planning: Estate and Gift Planning (3). Fundamentals, practical problems and solutions in basic estate and gift planning, business succession planning, and taxation issues. Prerequisites: 382 and 383.

400—Problems (1-99.9). Prerequisites: 300-level course in field of problem and instructor's consent.

410—Seminar (1-4). Reports and discussion of recent work in area of concentration. Prerequisite: graduate standing.

412—Research Methods in Consumer and Family Economics (3). Introduction to the scope, purpose and methods of research in consumer and family economics, with emphasis on economic survey methods. Prerequisites: graduate standing, an Introductory Statistics course. (Sociology 375 or Statistics 207).

415—Selected Readings (1-99). Selected readings. Prerequisites: graduate standing and instructor's consent

418—Topics (1-99). Selected current topics in field of interest. Prerequisite: graduate standing and instructor's consent.

419—Internship (1-99). Internships and/or field experiences under supervision. Prerequisites: graduate standing & instructor's consent.

450—Research (1-99). Independent research not leading to a thesis. Report required. Prerequisite: graduate standing and instructor's consent.

483—Family in the Economy (3). Multi-disciplinary study of research on families as economic units. Examines trends in family income, wealth, labor market participation, household production, distribution of household resources, use of public goods, and underground economy. Prerequisites: graduate standing; 380 and 387 or instructor's consent.

485—Human Resource Development and Allocation (3). Economic analysis of conditions, programs and policies related to development and use of human resources, with special reference to impact on families and households. Prerequisites: graduate standing; 387 or instructor's consent.

486—Social Policy and the Family Economy (3). Economic analysis of public programs that directly affect well-being of families: income maintenance, goods transfers, employment, housing, health, transportation, taxes, etc.; consideration of underlying philosophies, policy alternatives. Prerequisites: graduate standing; 387 or instructor's consent.

490—Research (1-99). Independent research leading to thesis or dissertation. Prerequisite: graduate standing and instructor's consent. Graded on a S/U basis only.

Curriculum and Instruction

College of Education
103 Rothwell Gym (573) 882-6462
Fax: [573] 884=2917

FACULTY

Martin Bergee, chair, associate professor, PhD, University of Kansas.

Larry A. Kantner, director of graduate studies, professor, EdD, The Pennsylvania State University.

Lloyd Barrow, professor, PhD, University of Iowa.

Robert J. Birkenholz, adjunct professor, PhD, Iowa State University.

Lonnie Echternacht, professor, EdD, University of Missouri-Columbia.

Stuart Palonsky, professor, PhD, Michigan State University.

Barbara Reys, professor, PhD, University of Missouri-Columbia.

Robert E. Reys, professor, EdD, University of Missouri-Columbia.

Richard D. Robinson, professor, EdD, University of Georgia.

Wendy Sims, professor, PhD, Florida State University.

Bob R. Stewart, professor, EdD, University of Maryland-College Park.

James D. Brown, associate professor, PhD, University of Illinois.

Linda Espinosa, associate professor, PhD, University of Chicago.

Roy Fox, associate professor, PhD, University of Missouri-Columbia.

Paul Germann, associate professor, EdD, University of Maine.

Adrienne Hoard, associate professor, PhD, University of Illinois.

Nancy Knipping, associate professor, PhD, Southern Illinois University.

Mary Lenox, associate professor, PhD, University of Massachusetts.

Linnea Lilja, associate professor, PhD, University of Minnesota.

Leon Schumacher, adjunct associate professor, PhD, Iowa State University.

Alex C. Waigandt, associate professor, PhD, University of Oregon.

Judith Wedman, associate professor, PhD, Oklahoma University.

Flore Zéphir, associate professor, PhD, University of Indiana.

Elizabeth Baker, assistant professor, EdD, Vanderbilt University.

David Barnes, assistant professor, PhD, University of Georgia.

Linda Bennett, assistant professor, EdD, University of Northern Colorado.

James Dyer, adjunct assistant professor, PhD, University of Illinois.

Mark Ehlert, research assistant professor, PhD, University of Missouri-Columbia.

Bryan Garton, adjunct assistant professor, PhD, The Ohio State University.

Carol Gilles, assistant professor, PhD, University of Missouri-Columbia.

James Oglesby, research assistant professor, PhD, University of Missouri-Columbia.

Joan Quilling, assistant professor, PhD, Michigan State University.

Harley Schlichting, assistant professor, PhD, University of Missouri-Columbia.

Sharon Schattgen, visiting assistant professor, PhD, University of Missouri-Columbia.

Joy Whitenack, assistant professor, PhD, Vanderbilt University.

DEGREES: MA or M Ed in curriculum and instruction with the following emphasis areas: art education, agriculture education, business/marketing education, early childhood education, educational technology, elementary education, English education, foreign language education, health education, mathematics education, music education, reading education, science education and social studies education; vocational-technical education and EdSp, EdD or PhD in curriculum and instruction with the following emphasis areas: agriculture education, art education, business/marketing education, early childhood education, elementary education, English education, foreign language education, health education, instructional theory and practice,

mathematics education, music education, reading education, science education, social studies education and vocational-technical education.

Graduate study in curriculum and instruction prepares teachers, curriculum leaders and teacher educators for professional excellence. With the rapid changes in education — especially developments in instructional materials and techniques, curriculum construction and classroom organization — teachers who have completed their certification may need to update, refine and extend their knowledge and skills. Further, many educators enter new roles as subject-matter specialists, curriculum coordinators, supervisors of instruction, department heads, leaders of inservice education or teacher educators. Graduate programs in curriculum and instruction are designed to prepare the professionals for these new roles.

These degree programs provide opportunities for professional study and advancement for people interested in leadership positions that cut across the traditional program areas of vocational-technical education. Majors in practical arts and vocational-technical education can elect an area of concentration in administration, curriculum development and research or teacher education. Concentration areas in disciplines outside professional education, such as economics, management and sociology also may be chosen.

See **Education** for general information.

GENERAL ADMISSIONS POLICY: Applications for admission to **master's degree programs** will be considered based on previous academic records, experience and scores on the Miller Analogies Test or Graduate Record Examination. In certain cases, references will be required. Applications for admission to the **specialist degree program** require scores for either the Miller Analogies Test or Graduate Record Examination. Note: for both the master's and specialist degree programs in mathematics education the Graduate Record Examination is required. Applications will not be considered without these scores. For admission to the **doctoral program**, the application should include Graduate Record Examination scores (preferred score of 1500 or higher), a brief statement of purpose, previous academic records, experience, references, and demonstrated potential for success.

Students whose native language is not English must submit scores on the TOEFL examination of 500–550 as designated by the emphasis area. All international applicants must take the Graduate Record Examination before admission.

For additional information write or call the Director of Graduate Studies in Curriculum and Instruction, 103 Rothwell, Columbia, MO 65211, (573) 882-6462.

CURRICULUM AND INSTRUCTION COURSES

F225—Human Relations in Organizations (3). Principles, theory, processes and problems of effective human relations in marketing organizations. w.

F264—Field Experience (1-2). The second level of field experience within one PAVTE program area at the secondary or post-secondary level. Student participates 30 clock hours for each semester hour of credit. S/U graded only. Prerequisite: F164.

F299—Student Teaching in PAVTE (1-99.9).

F300—Problems (1-99.9). Study of professional programs and issues or technical problems related to the field of practical arts and vocational education.

F301—Seminar (1-3). Seminar experiences for students within one of the PAVTE program areas. Prerequisite: instructor's consent.

F307—Coordination of Marketing Internship & Community Based Experience (3). Study of methods and techniques for organization, management and supervision of students placements in marketing internships and community based learning experiences. f,w,s.

F308—Coordination of Cooperative Occupational Education (3). Problems and procedures in the operation of cooperative occupational education programs. Especially designed for those who can qualify as coordinators of occupational education programs of a cooperative nature.

F310—Agriculture in the Community Schools (2-4). Organization of instructional program and of instruction in agriculture in the community school. Prerequisites: Baccalaureate degree & instructor's consent.

F314—Utility Software for Microcomputers (2). An introduction to major types of microcomputer utility programs, including desktop publishing, presentation, spreadsheet, and data base. Prerequisite: F114 or equivalent.

F315—Current Developments in Family and Consumer Sciences Education (3). Analysis of current concerns affecting family and consumer sciences education programs. Prerequisite: F235 and A205.

F321—Vocational Guidance (2-3). Problems, methods, procedures involved in assisting individuals in choosing, preparing for, entering upon, progressing in their vocation. For teachers, counselors, school administrators.

F325—Field Study in Occupational Education (1-4). Directed observation in a cross section of business and industry combined with reports, weekly seminars and/or conferences. May repeat until four semester hours accumulated.

F335—Word Processing Concepts and Procedures (3). Comparative study of word processing systems in modern offices; emphasizes advanced-level word processing concepts, procedures, and applications. Prerequisite: F314 or equivalent.

F345—Business Software Applications (3). Advanced concepts, features, and applications central to the major types of business software—spreadsheets, database management, word processing, graphics, and communications. Prerequisite: F314 or equivalent.

F360—Topics (1-99.9).

F365—Occupational Analysis (2). Techniques, procedures of analyzing occupations into their basic elements. Required of trade teachers, coordinators.

F372—Methods in Vocational Education for the Disabled & Disadvantaged (3). (same as Special Education L372).

F375—Development & Assessment of Vocational-Technical Curriculum (3). Curriculum development/assessment course focused on competencies, curriculum selection, organization, development, and assessment in the context of the Missouri Vocational Instructional Management System. Prerequisite: A205 and junior standing.

F380—Laboratory Planning and Management (3). This course is designed to acquaint the student with the procedures, techniques and skills necessary for proper organization, management, care and utilization of vocational facilities, programs, equipment and materials. Prerequisites: F10, F112 and F154.

F390—Technology and Industry Education Methods (2-3). Develops specialized organization and administration capabilities for Industrial and Technology Education. Topics include managing activities, individualized instruction, nontraditional students, students with disabilities, and emerging technologies. Prerequisite: professional standing, senior status.

F397—Curriculum Content in Marketing Education (3). Curricular development process, knowledge of core area and competencies of Marketing Education Program. Selection of instructional material. Prerequisite: A205 and B350.

F398—Methods of Teaching Marketing Education (3). Instructional materials, methods and techniques used to teach the marketing education curriculum. Includes evaluating delivery of instruction. Prerequisite: F375 and F397.

F400—Problems (1-99).

F405—Research Applications for Vocational Educators (2). Interpretation, evaluation, and application of research methodologies and findings for vocational educators. Prerequisites: 9 semester credit hours of graduate course work. f,w,s.

F406—Foundations/Program Development in Adult Vocational Education (3). The adult vocational education movement; characteristics of and learning principles applied to adult vocational students; instructional materials, methods and procedures in organizing and operating adult vocational education programs.

F409—Principles of Business Education (3). Organization, curriculum, problems, and trends of business education in secondary schools and colleges.

F410—Seminar in Practical Arts and Vocational-Technical Education (1-3).

F411—Philosophy of the Practical Arts and Vocational Education (3). Nature, purpose of practical arts and vocational education in modern school. For teachers of agriculture, business, home economics, industrial subjects, administrators.

F413—Theory Development in Family and Consumer Sciences Education (3). Analysis of theoretical developments occurring in the family and consumer sciences education profession with implications for program design and administration. Prerequisite: F395 or instructor's consent.

F415—Curriculum Development in Vocational Technical Education (3). In-depth investigation of curriculum development theory, research, issues and procedures in vocational, technical and practical arts education as found in public and private sectors. Prerequisites: a curriculum course or instructor's consent.

F421—Improvement of Instruction in Basic Business Subjects (3). Recent developments in methods, techniques and materials of instruction in the teaching of basic business subjects.

F430—Administration & Supervision of Family & Consumer Education Prog. (3). For those preparing to become administrators and supervisors of family and consumer sciences education programs and personnel. Prerequisite: F306 and F299.

F440—Planning Programs of Supervised Experience in Agr Occupations (2-4). Surveys agricultural situations. Develops activities which lead to establishment. Evaluates programs with different groups. Prerequisites: Baccalaureate degree or instructor's consent.

F444—Adult Education in Agriculture (2). Developing program objectives, organizing and conducting classes and methods of class and program evaluation for out-of-school groups and their co-curricular affiliates in agriculture. Prerequisites: F304 or instructor's consent.

F450—Methods of Teaching Agricultural Management (2-4). Determines needs, selects and organizes course content, and evaluates the instructional program in agricultural management. Prerequisites: Baccalaureate degree in Agriculture or instructor's consent.

F451—Measurement and Evaluation in Vocational Education (2-4). Development of evaluation procedures and the construction of evaluation devices for vocational education.

Emphasizes evaluation of student progress, improvement of instruction, and program evaluation. Prerequisites: course in Curriculum Construction or instructor's consent.

F459—Administration and Supervision of Vocational Education (2-3). Types of organization, approved administrative and supervisory practices of vocational, technical, and practical arts programs in secondary and post-secondary institutions. Prerequisite: F411.

F460—Topics (1-99).

F470—In-Service Course in Vocational-Technical Education (1-99).

F490—Research (1-99). Graded on a S/U basis only.

T250—Special Readings (1-3). Directed study of literature and research reports in education. cor.

T284—Physical Education Activities for the Elementary School (2). Theory organization of programs, and activities in content areas; fundamental movement skills, rhythmics, self-testing activities, sport related skills and games. Prerequisite: junior and professional standing.

T300—Problems (1-3). Studies professional programs and issues in health or physical education. Prerequisite: instructor's consent.

T303—Emergent Language in Early Childhood (3). Study of language learning in young children; how meaning of the environment is gained through language; implications for teachers working with children from varying language-learning environments. Prerequisites: T301 or Educational & Counseling Psychology A205.

T304—Family and Community Resources for Early Childhood Education (3). Lectures, visits to schools, investigation into developments in methods, materials, programs, and resources used in working with young children and their parents. Prerequisite: junior standing.

T305—Early Childhood Curriculum and Methods (3). Development, theory and practice in early childhood education. Prerequisites: junior standing, professional standing.

T306—Assessment in Early Childhood Education (3). Development 160 and Educational & Counseling Psychology A205. A study of formal and informal assessment instruments and procedures used to measure progress and determine developmentally appropriate curriculum for children in early childhood settings. Prerequisites: T301 or Child & Family Development.

T309—Literature in the Elementary School (3). Surveys the field of literature for children and adolescents, with emphasis on selected readings of various types of literature. Prerequisites: junior standing or instructor's consent.

T310—Seminar in Curriculum & Instruction (1-3).

T311—English Language Study in the Schools (3). Problems in teaching of standard English usage and in the use of current linguistic materials in the schools.

T312—Teaching the Language Arts in Elementary School (2). Procedures used in teaching integrated language arts in elementary grades. Prerequisites: Educational & Counseling Psychology A205 and professional standing.

T313—Literature for Adolescents (1-3). Selection and organization of materials for teaching literature to adolescents. Emphasizes literature written for adolescents and includes a unit on literature of American ethnic groups. Prerequisite: professional standing.

T314—Teaching of Composition (3). Current approaches to teaching composition in elementary and secondary schools with emphasis on the process of composing and evaluation of student writing. Prerequisites: English 20 or equivalent and professional standing.

T315—Teaching of Reading (3). Materials, methods used in teaching reading in elementary grades. Prerequisites: Educational & Counseling Psychology A205, professional standing. cor.

T316—Teaching Reading in the Content Areas (3). For secondary school teachers. Specific ways teachers can help students improve reading skills in content areas and ways reading can be taught in reading classes. Prerequisite: Educational & Counseling Psychology A205.

T317—Diagnostic and Corrective Reading in the Classroom (3). Procedures for diagnosing and correcting reading problems within the classroom. Prerequisite: T315 or equivalent.

T321—Teaching Science in the Elementary School (3). Concepts, materials, methods in elementary school science program. Prerequisite: professional standing and T271.

T324—Teaching of Science in the Secondary School (5). Techniques in teaching and evaluation of science in the secondary schools. Prerequisites: Educational & Counseling Psychology A205 and professional standing.

T332—Organization of Public School Art (2). Purposes, practices of art experiences in elementary and secondary schools. Designed for teachers, supervisors, administrators.

T350—Social Studies in the Elementary School (3). Problems in preparation, teaching of units with suitable materials, techniques. Prerequisites: Educational & Counseling Psychology A205, professional standing.

T355—Administration and Supervision of Music Programs (3). A study of the organization, management, and supervision of music programs. Prerequisite: instructor's consent.

T356—Advanced Techniques in Music Teaching (2-5). A review and evaluation of teaching/learning strategies in selected areas and levels of music instruction. Prerequisites: Music methods or instructor's consent.

T366—Diagnosis & Remediation of Learning Problems in Mathematics (3). The study of diagnostic and remedial instructional techniques for the teaching of mathematics. Emphasis is placed on alternative teaching methods and strategies. Prerequisite: T267.

T367—Teaching Techniques and Curriculum in Elementary School Math (3). The mathematics program in the elementary school from viewpoint of goals, content, techniques and evaluation.

T368—Teaching of Algebra in the Secondary School (3). Familiarizes prospective and in-service mathematics teachers with algebraic content in current secondary school mathematics programs and successful techniques for teaching this content.

T369—Teaching of Geometry in the Secondary School (3). Acquaints prospective and in-service teachers with geometric topics found in contemporary secondary school mathematics and effective techniques for teaching this content.

T371—Production & Use of Instructional Media Materials (3). Development of skills in the production and use of various forms of educational media and technologies

T375—Design of Print Based Instructional Materials (3). Development of skills in designing and developing instructional text. Including information graphics, learners' manuals, printed job aids, and programmed text.

T378—School Learning Resource Centers (3). (same as Information Science and Learning Technology Q316).

T379—Information Literacy in Teaching and Learning (3). Discusses the nature, value, and power of information as product and process; organization, retrieval, and evaluation of information; explores the Internet and information superhighway; develops skills for resource based learning for classroom instruction; policy issues.

T383—Teaching Second Languages (5). Course presents second or foreign language teaching methods appropriate to K-12, and practice and critique of those methods. Prerequisites: Educational & Counseling Psychology A205 and professional standing.

T384—Health Education in the Elementary School (3). Defines teacher's role in school health program; investigates health needs of school children; focuses on teaching strategies, health resources and development of elementary school health education curricula and materials.

T385—Motor Development in Early Childhood (3). Motor development of infants and children with emphasis on: study of interaction between biological and environmental factors affecting development, motor assessment techniques, and designing programs to enhance motor development. Prerequisite: Educational and Counseling Psychology A205.

T386—Education in Human Sexuality (3). The biological, psychosocial and educational aspects of human sexuality with special emphasis on instructional activities related to interpersonal communication, decision-making ability and clarification of values, course is designed for both teachers and health-care personnel. Prerequisite: T85 or equivalent.

T387—Curriculum in Health and Physical Education (3). Critical examination of health and physical education activities and programs leading to construction of general and special curricula for schools.

T388—Adapted Physical Education (2-3). Principles and practice of physical education, recreation and motor therapy for the exceptional child and adult. Prerequisites: Educational & Counseling Psychology A205, Anatomy 201 or Physiology 201, or instructor's consent.

T389—Organization and Administration of Health Education Programs (3). Study of health models for health promotion, disease prevention, and health education. Competencies are developed in needs assessment, behavior change, planning, and evaluation in health education programs.

T390—Drug Education (3). The psychosocial, legal and pharmacological aspects of the recreational use of over-the-counter and street drugs are investigated with emphasis being placed on personal decision making, principles of school and community drug education, rehabilitation and community health services.

T400—Problems (1-99).

T401—Perspectives in Parent Education/Parent Involvement (3). Consideration of the history and the influences of social, economic, political and educational changes leading to the development of parent involvement program components in the education of children in the primary grades.

T402—Issues in Early Childhood Education and Curriculum Practices (3). Focuses on historical and contemporary societal and educational issues affecting current curriculum decisions and practices in kindergarten and primary grades. Prerequisites: Classroom teaching experience or instructor's consent.

T403—Advanced Early Childhood Curriculum (3). Study of early childhood curriculum in contemporary educational settings along with selection of appropriate materials and development of instructional strategies for children, prekindergarten through early primary grades. Prerequisites: teaching experience or instructor's consent.

T407—Whole Language Curriculum (3). Whole Language Curriculum inquires into whole language theory, beliefs and practices. Students will explore and participate in classroom based inquiry projects, theme cycles, reflective practices, holistic assessment, and other learner-centered experiences such as literature study and writers workshop.

T408—Teaching Reading Through Literature Response (3). Teaching Reading Through Literature Response focuses on 1) reading as a personal and social process and 2) multiple responses to literature. Students will examine, use and critique; personalized reading, text sets (conceptually related materials), literature groups and other reading instruction experiences.

T409—Literature for Children and Youth (3). Systematic study of selected areas of particular importance to students of literature, teachers, librarians, supervisors, and school administrators. Prerequisites: T209 or instructor's consent.

T410—Seminar in Curriculum and Instruction (1-3).

T412—Elementary Language Arts Curriculum (3). Advanced study of language arts curricula including curriculum models, curriculum design and construction, concomitant instructional methods and evaluation. Prerequisites: under-

graduate Language Arts Methods course or instructor's consent.

T415—Practicum in Child Study I (3-5). Practicum experiences in diagnosing educational problems of school children. Prerequisites: T315 or T316, T318, Educational & Counseling Psychology A303.

T416—Practicum in Child Study II (3-5). Practicum experiences in applying remedial procedures to children with educational problems. Prerequisite: T415.

T417—Practicum in Child Study Supervision (3-5). Practicum experience in supervising and directing a clinic involved with educational evaluation. Prerequisites: T415 & T416.

T418—Reading Miscue Analysis (3). The process in which readers construct meaning by relating their sociopsycholinguistic backgrounds to discourse. 15 studied miscues (text deviations) are analyzed at several linguistic levels. A comprehension centered reading program is developed. Prerequisites: T315 or T316, or equivalent.

T419—Analysis & Correction of Reading Disabilities (3). Diagnostic and corrective procedures in reading instruction that may be used for clinical study. Prerequisites: T315 or instructor's consent.

T420—Issues and Trends in Reading Instruction (3). Provides intensive study of significant issues and current trends in reading on all instructional levels. Prerequisites: T315, T316 or equivalents or instructor's consent. cor.

T421—Survey of Science Education (3). Survey of development of science education and study of changes in methodology and philosophy. Prerequisite: undergraduate course in Science Methods.

T422—Curricula in Science Education (3). Advanced study of science education curricula with option for elementary or secondary emphasis. Study of exemplary science programs, curriculum models, curriculum design and construction, concomitant instructional methods and evaluation. Prerequisite: undergraduate course in Science Education.

T423—Review of Research in Science Education (3). Studies appropriate research methodologies and reviews research and selected readings in science education. Allows option for elementary or secondary emphasis for specific areas: life, physical or earth sciences. Prerequisite: undergraduate course in Science Education.

T424—Trends and Issues in Science Education (3). Provides intensive study of current trends and significant issues of science affecting both the elementary and secondary levels of science education. Prerequisite: undergraduate course in Science Education.

T425—Advanced Teaching of Elementary Science (3). A study of science curriculum and teaching in elementary school from viewpoint of research teaching strategies, evaluation, and developing trends. Prerequisites: teaching experience and science methods course.

T426—Advanced Teaching of Secondary Science (3). Studies secondary science curriculum and teaching from viewpoint of research strategies, teaching strategies, conceptional formats. Prerequisite: secondary science methods course.

T430—Survey of Art Education (3). Provides survey of the development of art education and problems in the field by means of a critical inquiry. Prerequisite: graduate standing.

T431—Curriculum in Art Education (3). Advanced study of art education curricula, with option for elementary or secondary emphasis. Study of exemplary art programs, standards of quality, curriculum models, curriculum design and construction, concomitant instructional methods and evaluation. Prerequisite: graduate standing.

T432—Review of Research in Art Education (3). Studies appropriate research methodologies and reviews research and selected readings in art education. Prerequisite: graduate standing.

T438—Extracurricular Activities (3). (same as Educational Administration C438).

T440—The Elementary School Curriculum (3). Studies elementary curriculum with regard to selection of objectives and content, and to provisions for curricular change.

T443—Tests and Measurements for Elementary and Secondary Schools (3). Educational tests, measurements from points of view of teachers, supervisors, administrators.

T444—The Supervision of Student Teaching (3). Theory, knowledge and practices involved in supervision of student teaching and other professional lab experiences. Offers assistance in all major aspects of supervision of student teaching.

T445—The Secondary School Curriculum (3). For secondary school principals, teachers, superintendents. Presents trends in curricular change, methods of curricular investigation. cor.

T446—Curriculum Construction for Secondary Schools (3). Designed for those engaged in curriculum revision work and construction of new secondary school courses. Prerequisite: T445 or instructor's consent.

T448—Analysis of Instructional Behavior (3). (same as Educational Administration C448).Teaching models and a systematic review of literature on instructional behavior and student achievement. Methodological strategies for conducting naturalistic classroom research stressed. For advanced master's and doctoral students. Prerequisite: graduate standing.

T449—Managing Classrooms for Learning (3). Theoretical assumptions, goals, and research that inform various approaches to classsroom management advocated for practitioners. Includes strategies for conducting action research on classroom management. Prerequisites: An educational psychology course or instructor's consent.

T450—Patterns for Instruction in Social Studies (3). Presents and evaluates strategies for planning, teaching, and evaluating social studies in elementary and secondary schools.

T452—Secondary Social Studies Curriculum (3). Examines current theory, trends and practices in secondary social studies curriculum with a practicum in curriculum development.

T453—Elementary Social Studies Curriculum (3). An in-depth study of objectives, goals, patterns and practices in elementary social studies curriculum. Focus will be upon instructional strategies and materials and current trends influencing curriculum development.

T456—Foundations of Music Education (3). A study of the history, philosophy and rationale of music education. Prerequisite: instructor's consent.

T457—Curriculum Materials in Music Education (2-5). A development of critical abilities in evaluation and selection of music education materials. Section 1: Elementary; Section 2: Secondary Vocal; Section 3: Instrumental. Prerequisite: instructor's consent.

T458—Techniques in Instrumental Music Teaching (3). A practical study of the organization and instruction of class teaching, with demonstrations by instructor and class. Prerequisite: instructor's consent.

T461—Advanced Piano Pedagogy I (3). (same as Music 461).

T462—Advanced Piano Pedagogy II (3). (same as Music 462).

T467—Using Manipulative Materials in Teaching Mathematics III (3). Mathematics laboratory is developed and integrated with experiences in setting. Emphasis on materials for primary and intermediate grades.

T470—In-Service Course in Curriculum and Instruction (1-99.9). Course work adapted to current vocational needs. Prerequisite: instructor's consent.

T480—Internship in Curriculum and Instruction (1-99). Provides internship experience under supervision in advanced levels of curriculum and instruction. Prerequisite: departmental chairman's consent.

T484—Health Promotion and Wellness Education (3). Design, development, implementation, and evaluation of comprehensive wellness programs. Enables health-related professionals to learn the fundamentals of organizing and administering wellness programs in corporate, hospital, college/university, school, and community settings. Prerequisite: instructor's consent.

T485—Individual Research (1-3). Independent research not leading to thesis. Prerequisites: consent required.

T490—Research in Curriculum and Instruction (1-99). Graded on a S/U basis only.

T495—Classroom Research (3). Study of original classroom research and theories of instruction leading to plans for personal research and theory development. Prerequisites: T448 and advanced graduate standing.

T496—Ethnographic Research in Education (3). Investigate practical aspects, nature, and assumptions of ethnographic research in education. Pilot study required. Prerequisites: A354 or equivalent.

Economics

College of Arts and Science
118 Professional Building (573) 882-0063
Fax: [573] 882=2697

FACULTY

Michael Podgursky, chair, professor, PhD, University of Wisconsin-Madison. Labor and economics of education.

Ronald A. Ratti, director of graduate studies, professor, PhD, Southern Methodist University. Monetary economics.

W. Whitney Hicks, director of undergraduate studies, professor, PhD, Stanford University. Economic development.

Floyd Harmston, professor emeritus, PhD, University of Missouri-Columbia.

Maw Lin Lee, professor emeritus, PhD, University of Wisconsin. Applied econometrics.

David J. Loschky, professor emeritus, PhD, Harvard University. Economic history and demography.

Carmen F. Menezes, professor, PhD, Northwestern University. Microeconomic theory.

Paul Smith, professor emeritus, PhD, University of Michigan.

Elizabeth A. Dickhaus, associate professor, PhD, University of Missouri-Columbia. Economic education.

Charles G. Geiss, associate professor, PhD, University of North Carolina. Mathematical economics.

Walter L. Johnson, associate professor, PhD, Duke University. Money and banking.

David M. Mandy, associate professor, PhD, University of Illinois at Urbana-Champaign. Econometrics, microeconomic theory, and industrial organization.

Peter R. Mueser, associate professor, PhD, University of Chicago. Labor economics.

Shawn X. Ni, associate professor, PhD, University of Minnesota. Macroeconomic theory.

Neil A. Raymon, associate professor, PhD, University of Colorado-Boulder. Macroeconomic theory.

Donald J. Schilling, associate professor emeritus, PhD, University of North Carolina. International finance.

Xinghe Wang, associate professor, PhD, University of Iowa. Mathematical economics.

David E. Chesser, assistant professor, PhD, University of Virginia. International finance.

Ting Gao, assistant professor, PhD, University of Michigan. International finance and international trade.

Economics

Mark J. Jensen, assistant professor, PhD, Washington University. Econometrics.
Van Hoang Pham, assistant professor, PhD, Cornell University. Development economics and international trade.
Kenneth R. Troske, assistant professor, PhD, University of Chicago. Labor economics.

DEGREES: MA and PhD in economics

The Department of Economics offers graduate work leading to the master of arts and the doctor of philosophy degrees. The program prepares students for careers in government and private enterprises, colleges, universities, and research institutions through training in the techniques and applications of economic analysis, interpretation of data, and the formulation and appraisal of public policy.

The department offers fields of specialization in many traditional fields in economics with particular strength in monetary and financial economics, international trade and finance, economic development, and labor and demographic economics. Special arrangements are available for students to pursue graduate study in mathematics concurrent with graduate study in economics.

Student financial support is available to graduate students as teaching and research assistantships, allocated based on promise and performance in the program. In addition, direct fellowship support may also be available to selected candidates. Tuition is waived for students who receive assistantship or fellowship support. January 15 is the deadline for applications for assistantships for the school year beginning in August, but earlier submissions are desirable. Late applications will be accepted subject to the availability of openings and funds. Admission may be granted at any time to qualified students.

For specific information and/or application forms, please write the Graduate Secretary, 118 Professional Building, Columbia, MO 65211 or e-mail at Riddell@missouri.edu.

MASTER'S DEGREE: Students with a bachelor's degree in any field may apply for admission into the master's program. Applicants are admitted based on undergraduate record, with particular emphasis on performance in economics, mathematics, and statistics courses, performance on the Graduate Record Examinations (GRE) general test, and letters of recommendation. Although the graduate program assumes mathematical background through calculus (normally two or three semesters of college calculus), and undergraduate economics training, applicants with more limited backgrounds may be accepted into the program. Such individuals will be assigned support course work, some or all of which may be counted toward fulfilling requirements. TOEFL scores are required of an applicant whose native language is not English.

To fulfill requirements for the MA degree, a candidate must complete a 30-hour approved program of study. This includes 15 credit hours of core courses: 370 (mathematical economics), 405 (microeconomics), 453 (macroeconomics), and 472 and either 473, 475, or 476 (econometric methods). In addition, students must enroll in two semesters of 413 (MA research workshop) and one credit hour of 400 or 490 for completion of the student's major research paper. Of the remaining 12 elective hours, six must be chosen from among 400-level courses in the Department of Economics (except 400, 402, 423, 480 and 490), with one of these courses corresponding to the area of the student's major research paper.

Students are required to write a major research paper and to defend it at a seminar open to all faculty and students. This presentation is the capstone of the 400/490 credit required of all MA students. Although the paper may be written in conjunction with a graduate course, it is expected to be considerably more substantial than the usual term paper. The student may choose to designate the paper as an MA thesis, or as a paper in lieu of thesis. In either case, up to three additional hours of elective credit may be earned for research on the paper, with registration in 490 for students choosing the thesis option and 400 for those choosing the nonthesis option.

As a final option, the student can earn an MA while working toward a PhD by passing the comprehensive examinations, provided the MA course requirements have been satisfied.

DOCTORAL DEGREE: The PhD is granted to those who have gained a comprehensive knowledge and understanding of theoretical and applied economics. Only those who show promise of superior attainment are admitted to candidacy.

Ordinarily, to be accepted for advisement in the PhD program, a student must have a master's degree in economics, or, alternatively, the student must meet the requirements for admission to the MA program, together with the requirement of an adequate background in economics, mathematics, and statistics.

The PhD program is designed to encompass training in economic theory and quantitative methods, as well as flexibility for students in choosing course work to suit their interests and intended careers. For those entering the program with a bachelor's degree, the following courses are required: 370 (mathematical economics); 405-406 (microeconomics); 453-454 (macroeconomics); 470 (dynamic optimization); 472-473 and either 475 or 476 (econometric methods); two credit hours of 413 (research workshop I), one credit hour of 400 or 490 for completion and presentation of the research paper begun in 413, and one credit hour of 423 (research workshop II); six credit hours of 400-level economics courses in each of two areas of specialization; one other 400-level economics course (excluding 400, 402, 480, and 490); 14 additional credit hours of elective course work within the department, or course in related areas outside economics; and 12 credit hours of dissertation research; for a total of 72 credit hours. Courses taken to satisfy these requirements (except dissertation research) may be taken while earning an MA at MU, or, as with students entering the program with a master's degree, at other accredited colleges and universities as recommended by the students' PhD committee.

Examinations: Students pursuing the PhD degree must pass a qualifying examination and a comprehensive examination. Upon completion of relevant required courses, normally after two semesters in the program, students take the qualifying examination, which is a written examination in both microeconomic and macroeconomic theory. Students who fail one or both parts are allowed to take the failed part a second time. Subject to approval by the department, a third attempt may be allowed for either or both parts.

The comprehensive examination, normally taken in the third year of study, is a written examination in the student's two areas of specialization. The part concerning each area of specialization is normally three hours in length. The comprehensive examination is administered at times set by the director of graduate studies. The content is designed to stand in reasonable relation to the nature and objectives of the student's program of study. Students who fail either part of this exam are automatically allowed to take the failed part a second time.

Dissertation: The dissertation must make a substantial contribution to knowledge. Upon completion of the dissertation, students pursuing the PhD degree must pass a final oral examination. This exam can include an evaluation of the dissertation, the student's defense of the dissertation, and the student's general comprehension of economics, and is open to the academic community.

COURSES

201—Topics in Economics (1-99). Organized study of selected topics. Subjects and credit may vary from semester to semester. Prerequisites: economics courses, and number of credit hours may vary with topic.

204—Principles of Economics for Teachers (3). Covers mostly micro concepts, but includes some macro. Course includes demonstration lessons on how to teach economics K-12. (Limited to Education majors).

224—Introduction to International Economics (3). A topical course which emphasizes the application of basic economic analysis to real and current international economic issues. Topics include free trade, protectionism, free trade areas, multilateral trade negotiations, trade and development, exchange rates, the International Monetary System, and economic integration. Prerequisite: 4 or 14 or 51.

229—Money and Banking (3). Operation of the U. S. financial and economic system. Covers interest rates, banking regulation, the money supply process and the conduct of the Federal Reserve, inflation and the macroeconomy, exchange rates and the international financial system, rational expectations, and efficient markets. Prerequisites: 1 or 5, and 4 or 14, or 51.

251—Theory of the Firm (3). Introduces price theory and the economics of the firm. No credit for students who have completed 351. Prerequisites: 1 or 5, and 4 or 14, or 51.

256—Economics of Public Policy: Antitrust Economics (3). Competition and monopoly and their roles in the American economy. Prerequisites: 1 or 5, and 4 or 14, or 51.

261—Economic Transformation in Eastern Europe & Former Soviet Union (3). An analysis of economic stabilization, liberalization and structural transformation in the transition from centralized planning toward a market economy. Prerequisites: 4, 14 or 51 or instructor's consent.

271—Introduction to Applied Econometric Practice (3). Introduction to the use of regression analysis of economic data, including simple and multiple regression, dummy variables. Econometric problems considered include heteroscedasticity, autocorrelation, multicollinearity and simultaneous equation issues. Prerequisites: Economics 1 or 5, and 4 or 14, or 51 and Statistics 150.

299—Honors Proseminar (2-3). Research for graduation with Honors in economics.

300—Problems (1-99). Credit arranged by instructor.

301—Topics in Economics (1-5). Study in applied or theoretical economics. May be repeated for credit to a maximum of 5 hours. Prerequisite: instructor's consent.

311—Labor Market, Employment and Wages (3). Surveys theoretical explanations of wage and employment determination in contemporary labor markets. Prerequisites: 251 or 351.

312—Special Topics in Labor Market Analysis (3). Topics illustrate the economics of labor market institutions, including union formation, discriminatory labor market behavior and the structure of compensation. Prerequisite: 251 or 351 or instructor's consent.

315—Public Economics (3). Analyzes economic effects of government expenditures, taxes and debt. Expenditure and taxation principles, tax reform, cost-benefit analysis, fiscal policy. Prerequisites: 251 or 351.

316—State and Local Finance (3). State and local tax and expenditure problems, intergovernmental fiscal relations, problems of metropolitan areas. Prerequisites: 251 or 351 or instructor's consent.

320—Introduction to Economic Doctrines (3). Origins of modern economic thought in the context of social and intellectual environment of the time in which they originated, their contribution to their period and to modern thought. Prerequisites: 1 or 5, and 4 or 14, or 51.

322—Economics of Regulation (3). Economic issues concerning the role of government regulation. The course examines the rationale for and effects of regulatory policies in public utilities, transportation, and communications industries. Prerequisites: 351 or 251.

325—The International Monetary System (3). Study of macroeconomic and monetary relationships between the US and the world. Topics include balance of payments, foreign exchange rates, history of the international monetary system. Prerequisite: 229.

326—Economics of International Trade (3). The microeconomic theory of international trade. Topics include comparative advantage, the theory of commercial policy, economic integration, trade with LDC's and the trade effects of economic growth. Prerequisites: 351 or instructor's consent.

329—The Banking System and the Money Market (3). Organization of the money market; credit control procedures and aims, effect of bank expansion and contraction on money market and national income deregulation. Prerequisite: 229.

332—Microeconomics for Managers (3). Microeconomic concepts presented at the intermediate level, graphic treatment with limited calculus, managerial issues presented at the MBA level. Prerequisites: 4, or 14, Math 60. +/- grading systems. (Not open to economics majors) must have a consent card for MBA program.

337—Economics of Speculative Markets (3). Considers the economic purpose of speculative markets and derives their price formation mechanisms. A historical approach is used to develop the problems involved in predicting prices and to evaluate the tools that have been used in attempting prediction. Prerequisite: 1 or 5, and 4 or 14, or 51 and a calculus course or instructor's consent.

345—Economics of Education (3). Economic theory is used to analyze the market for educational sevices and education policy. Topics include: human capital theory, cost and performance measures for public and private schools, market based approaches to school reform, school finance, higher education cost and access. Prerequisite: Economics 4 or 14 or 51, and 271 (or one course in Statistics and regression analysis).

351—Intermediate Price Theory (3). Theory of rational behavior in consumption, production, and pricing decisions of households and firms. Partial equilibria in product and factor markets under competition, monopoly, oligopoly and monopolistic competition. A brief introduction to general equilibrium and welfare economics is provided. Calculus is employed. No credit for students who have completed 251. Prerequisites: 1 or 5, and 4 or 15, or 51, and Math 61 or 80 or 108.

353—Intermediate Income Analysis (3). National income concepts; national income accounting; theory of income determination. Prerequisite: 229.

355—The Structure of Industry (3). Analyzes the structure of industry; its impact on the operations of the firm; and its significance for public policy. Prerequisites: 251 or 351.

360—Economic Development (3). (same as Peace Studies 360). The study of less-developed countries including problems of measuring economic growth, analysis of sources of economic growth, causes of changes in economic and structure, development and trade policies. The consequences of goals and assumptions for development policy are analyzed. Prerequisite: 229, and 251 or 351.

361—Comparative Economic Systems (3). Study of capitalism, market socialism, and central planning. Prerequisites: 229, 251, or 351.

362—Welfare Economics (3). Role of value judgments; meaning and measurement of economic welfare; interpersonal comparisons; cardinal and ordinal utility; Pareto optimality, conflicts of interest and distribution of income; individual values and social choice. Prerequisite: 351.

368—Macroeconomic Forecasting (3). Theory and practice of forecasting macroeconomic variables. Emphasis on acquiring skills in data analysis, basic SAS programming, single equation regression and time-series analysis, and the mathematical principles of forecasting. Prerequisite: Statistics 150 (suggested: 229)

370—Introduction to Quantitative Economics (3). Introduction to the mathematical language of economic theory. Topics include multivariate calculus, introductory linear algebra, optimization, dynamic analysis, and stability. Prerequisite: Math 80 or equivelent, or instructor's consent.

371—Applied Econometrics (3). Study methods for quantitative analysis of economic data. Estimating techniques, tests of significance, prediction and forecasting reviewed with respect to problems presented by economic data and information demands of economic decision models. Prerequisites: 251 or 351, 253, or 353, and 271.

372—Mathematical Economics (3). Application of mathematical methods to selected topics in economic analysis. Prerequisites: 370 or Mathematics 201 or instructor's consent.

384—Structural Change in Economic History (3). Explores changes in the structure of the American economy from its earliest colonial beginnings. Structural change, an integral part of growth, is related to technical change, population growth and to the content and form of economic theory. Prerequisite: Econ 1 or 5, and 4 or 14, or 51 or instructor's consent.

398—Senior Seminar in Economics (3). (capstone course). Seminar for graduating seniors who are majoring in economics. Multiple writing assignments will emphasize synthesis of theoretical, empirical, and institutional economics. Not open to non-majors.

399—Independent Study (1-99). Individual work, with conferences adjusted to needs of student. Prerequisite: instructor's consent.

400—Problems (1-99). Graduate students may select topics for study and investigation subject to approval by supervising faculty.

401—Topics in Economics (3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: instructor's consent.

402—Problems in Economic Education (1). Seminar devoted to methods of increasing the effectiveness of the teacher of economics.

405—Advanced Microeconomics Theory I (3). The theory of rational behavior and partial equilibrium in markets. Topics include consumer behavior, theory of the firm, decision making under uncertainty, perfect competition, monopoly and monopsony, and imperfect competition. Prerequisite: graduate standing or instructor's consent.

406—Advanced Microeconomics Theory II (3). Survey of equilibrium theory and market failures in economics. Topics include the structure and modeling of games, and cooperative and non-cooperative equilibrium concepts. Prerequisite: Economics 405 or instructor's consent.

411—Topics in Wage and Employment Theory (3). Analysis of the determination of wages and employment and the relation of trade unionism to the economy. Prerequisite: 405.

412—Workshop in Labor Economics (3). Applications of contemporary analytical techniques to labor market topics chosen by the instructor. Prerequisites: 405.

413—Research Workshop I (1-2). Combines instruction, student presentations, and seminar participation to introduce research methods and practice. Substantial portions of a major research paper are required. May be repeated once for credit. Students may take 413 for two hours credit in one semester only with the approval of the Director of Graduate Studies. Prerequisite: 405 or instructor's consent.

415—Advanced Public Economics I (3). Tax incidence and optimal taxation in static economies and issues of taxation in dynamic economies. Prerequisite: 405.

416—Advanced Public Economics II (3). Macroeconomic issues of government finance. Theoretical and empirical analysis of Ricardian equivalence. Prerequisite: 405.

420—History of Economic Thought (3). Analysis of development of economic theory; emphasis on evaluation of classical doctrine. Prerequisite: 405.

423—Research Workshop II (1). Research seminar for doctoral students. Requires presentation of original research and attendance at presentations by other students and faculty. May be repeated for credit. Prerequisites: two credit hours of 413 or consent of Director of Graduate Studies. Graded on a S/U basis only.

425—International Finance (3). International monetary theory and macroeconomic equilibrium in open economies. Prerequisites: 353 or equivalent; 371 or equivalent.

426—International Trade (3). Pure theory of international trade and commercial policy. Prerequisite: 405.

430—Advanced Money and Banking (3). The working and structure of institutional arrangements, welfare aspects of structural policies, operation of money and credit markets, and behavior of returns on assets. Prerequisites: 405 and 472.

431—Central Banking Policies (3). Examines central banking procedures, policies and the role they play in maintaining economic stability. Special attention to connection of Federal Reserve System with money and capital markets. Prerequisites: 405 and 472.

452—Seminar in Microeconomics (3). Seminar covering advanced topics in microeconomic theory, with particular coverage to be announced by the course instructor. Prerequisite: 406.

453—Advanced Income Analysis (3). Aggregate models of life-cycle microfoundations, of macroeconomic fluctions and growth. Prerequisite: 353 or equivalent; at least concurrent enrollment in 405.

454—Seminar in Macroeconomics (3). Analyzes topics in income analysis, including capital theory and economic dynamics. Prerequisite: 453.

455—Monopoly and Competition (3). A survey of the theoretical and empirical literature on the organization of industries. Includes study of monopolized markets, competitive markets, and strategic interaction among firms in imperfectly competitive markets. Both the rationale and practice of anti-trust policy are studied. Prerequisite: 405.

456—Seminar in Public Utility Regulation (3). The rationale for and policies towards regulated monopolies. Includes

the theory of natural monopoly, Ramsey prices, contestable markets, and sustainability. The economics of regulation, deregulation, and reregulation will be discussed. Prerequisite: 405.

460—Theory of Economic Development (3). Theories of economic development critically examined. Sources and consequences of growth processes analyzed in context of economic theory and historical occurence. Prerequisites: 405 and 472.

470—Dynamic Optimization (3). Topics to be covered include calculus of variations, optimal control theory, dynamic programming in discrete time variables, and economic modeling. The Euler Equation, the Transversality Condition and the Bellman Equation will also be covered. Prerequisite: 370.

471—Game Theory (3). Presents core concepts in game theory and illustrates their uses with a range of applications. Prerequisite: 405 and 406.

472—Econometric Methods I (3). Familiarizes students with fundamental techniques found and used in applied economic researh. Topics include: ordinary least squares, generalized least square, instrumental variables, maximum likelihood estimation, and generalized methods of moments. Prerequisite: Statistics 320 or equivalent.

473—Econometric Methods II (3). Introduces students to econometric concepts and techniques at a theoretical level, and provides a bridge to understanding the econometric literature. Topics include: probability theory, convergence, simultaneous equations, nonlinear models, and nonparametric estimation. Prerequisite: 472.

475—Empirical Microeconomics (3). Introduction to advanced econometric techniques commonly used in applied microeconomic research. The topics covered will be panel data, instrumental variables estimation, limited dependent variables, truncated, censored and selected selected samples, and duration models. Prerequisite: 472.

476—Applied Time Series Analysis (3). Provides a student with econometric background in time series terminology and techniques to perform applied research in empirical macroeconomics, microeconomics and finance. Topic include: stationary and nonstationary models, ARCH, unit root tests, VAR, and cointegration. Prerequisite: 472.

477—Advanced Time Series Analysis (3). This course equips a student with the tools necessary to read and conduct publishable time series research. Topic include: spectral analysis, functional central limit theorem, unit root test, long memory, and wavelets. Prerequisite: 473.

478—Input-Output Analysis (3). Rationale of intersectorial analysis explored; theoretical and practical problems of construction discussed; applications of input-output demonstrated. Prerequisite: 370 or instructor's consent.

479—Advanced Seminar in Quantitative Economics (3). Current topics in quantitative economics. May repeat for credit. Prerequisite: instructor's consent.

480—Independent Readings for Ph.D. Comprehensive Examinations (1-6).

484—Selected Topics in Economic History (3). Techniques of the new economic history are explored in the context of European economic development. Prerequisites: 405.

490—Research (1-99). Thesis research for M.A. or Ph.D. degree. Graded on a S/U basis only.

Education

College of Education
109 Hill Hall (573) 882-6098, Fax: [573] 884=5967
http://www.coe.missouri.edu

GRADUATE PROGRAMS in education are coordinated by the College of Education and administered by the following academic units in the college:

- Curriculum and Instruction
- Educational Leadership and Policy Analysis
- Educational and Counseling Psychology
- Information Science and Learning Technologies
- Special Education

The academic units provide programs that lead to the master of education, master of arts, educational specialist, doctor of education and doctor of philosophy. General information is contained in this section. Faculty and degrees are listed by academic unit under the individual fields of study.

For more information write or call Graduate Studies, College of Education, 109 Hill Hall, Columbia, MO 65211, (573) 882-6098.

ENTRANCE REQUIREMENTS: All graduate students in education are required to submit, as part of their application materials, the general test scores of the GRE (see specific departmental requirements). The examination should be taken before acceptance.

An individual admitted to a program leading to the degree of master of education (M Ed) or master of arts (MA) in education may be required to complete a minimum of 15 semester hours of prerequisite education course work approved by the academic unit. These hours must include courses that will assure that the student is reasonably knowledgeable about the field of education as a societal institution and as a scholarly discipline, and has mastered the content of the area of specialization to a degree that would permit the enrollment in 400-level courses in the specialty.

Specific information regarding the fulfillment of this requirement may be secured from the academic unit. An applicant, who may be otherwise qualified but who has not completely satisfied the prerequisites, may be admitted to a degree program and satisfy the prerequisites before receiving the degree. However, courses taken to remove or correct deficiencies may not be applied toward any graduate degree.

Prospective graduate students should apply to the office of graduate studies in their specific academic units at least 60 days before the initial enrollment. Some academic units set more stringent deadlines. The student who fails to apply before this deadline may be admitted conditionally, pending determination of qualifications.

To be accepted for advisement for the M Ed or the MA in education, an applicant must have acceptable scores on the required examinations. An undergraduate GPA of at least 3.0 (A=4.0) or the equivalent during the last two years of undergraduate work is preferred. However, a student with an undergraduate GPA of between 2.5 and 3.0 may be considered for probationary acceptance if other background information or circumstances indicate likelihood of success.

M Ed DEGREE: A total of 32 semester hours of course work is required for the degree. A minimum of 24 semester hours must be taught by MU faculty and off-campus course work offered by MU faculty may be used in a program. The program may be met in part by the transfer of a maximum of eight semester hours earned at an institution accredited to offer graduate work. Transfer credit must be approved by the student's adviser and the dean of the Graduate School. Extension and correspondence course work from other institutions may not be transferred into the program. Up to eight semester hours of course work taught by MU faculty may be taken through the Center for Independent Study. No more than 12 semester hours of course work taken at MU while in the post-baccalaureate special status may be used in a program. All course work must be completed within an eight-year period.

Beyond the prerequisites, the program of study is at least 32 semester hours of approved graduate courses, including a minimum of 16 semester hours in courses at the 400 level. The program may consist entirely of courses in education or may be made up, in part, of courses from other disciplines selected to fit the candidate's professional needs. However, the program must include a minimum of 16 semester hours of graduate work in education. One course in the social, philosophical or historical foundations of education or one foundations course in the behavioral sciences must be included in the program. The program of study also must contain a course that enables the student to read, interpret and evaluate reports in educational research.

A program of study (M1 Form) must be submitted to the Graduate School at least one semester before graduation.

A thesis is not required, but the major adviser may require written reports of field work or special investigation.

A final comprehensive examination or its equivalent is required. The examination encompasses the major areas of emphasis on the student's program of study. If not otherwise registered for courses on campus, a student must be enrolled for "examination only" during the semester or session in which the master's comprehensive examination is taken. Students who fail the exam twice may petition the academic unit for permission to retake the exam a third time. No student is allowed to take the final exam more than three times.

THE MA DEGREE emphasizes research. Students may choose to complete the MA by producing a thesis (Plan A) or a publishable paper (Plan B). Prerequisites and admission requirements are the same as for the master of education.

The program of study consists of a minimum of 30 semester hours of graduate course work. A minimum of 24 semester hours must be taught by MU faculty and off-campus course work offered by MU faculty may be used in a program. The program may be met in part by the transfer of six semester hours earned at an institution accredited to offer graduate work and by a maximum of six semester hours of correspondence course work offered by MU faculty through the Center for Independent Study. Extension and correspondence courses from other institutions may not be included in the program. No more than 12 semester hours of course work taken at MU while in the post-baccalaureate special graduate status may be used in a program. The program must include a minimum of 15 semester hours in courses at the 400 level and a minimum of 15 semester hours of graduate work must be in education. All course work must be completed

within an eight-year period.

The program of study for the MA emphasizes research and must include a course in educational statistics (A354 Introduction to Educational Statistics). One course in the social, philosophical, or historical foundations of education or one foundations course in the behavioral sciences is also required.

The thesis MA (Plan A) requires acceptance of a thesis by a committee of three graduate faculty members. A course in methods of research and three to six semester hours of 490 Research are required. The nonthesis MA (Plan B) requires academic unit acceptance of a completed research project presented as a typescript formatted for submission to a professional journal in the candidate's discipline. Three to six semester hours of 400 Problems or 450 Research must be earned for the nonthesis MA degree. After completion of the thesis or manuscript, a final examination is conducted. A report of the examination is sent to the Graduate School (M2 Form). If not otherwise registered for courses on campus, a student must be enrolled for "examination only" during the semester or session the thesis or manuscript is completed.

The program of study (M1 Form) must be submitted to the Graduate School at least one semester before graduation.

EdSp DEGREE: The educational specialist degree represents a program of organized and approved graduate work, consisting of a minimum of 30 semester hours beyond the requirements for the master's degree in the same area of education in which the master's degree was taken.

The program is directed by an advisory committee and supervised by the major adviser. Formation of the committee must be reported to the Graduate School (S1 Form). A candidate for the degree must submit a program of study (S2 Form) to a committee of three faculty; the department director of graduate studies; and the dean of the Graduate School. The program of study (S2 Form) must be approved before completion of the last eight semester hours of the program and at least one semester before graduation.

Evidence of proficiency in educational statistics and research methodology must be provided before the candidate's final examination. This evidence will normally be the satisfactory completion of A354 Introduction to Educational Statistics and A409 Overview of Educational Research. If not completed as a part of the master's degree, the program must include a graduate course in the behavioral, social, philosophical, or historical foundations of education. The program may consist entirely of courses in education or, in part, of courses selected from other disciplines, however, a minimum of 15 semester hours in education is required. A minimum of 15 semester hours of course work is required at the 400 level. No more than 12 semester hours of course work taken at MU while in the post-baccalaureate special graduate status may be used in a program. A thesis or seminar paper may be required by the advisory committee.

The required 30-semester-hour program must be completed within a period of eight years. The work may be taken in summer sessions. A maximum of six semester hours may be accepted in transfer from institutions accredited to offer postmaster's degrees. Transfer courses must be graded "B" or better. Extension or correspondence courses from other institutions cannot be used on the program. A maximum of six semester hours of course work offered by MU faculty through the Center for Independent Study may be used in the program. Off-campus courses offered by MU faculty may be included in the program. Six semester hours of the program must be completed within one semester or summer session to provide an in-residence experience.

The advisory committee may require a candidate to take a qualifying examination. If required, the examination must be administered during the initial semester of enrollment and before the filing of the program of study.

A final examination is required, and the results must be reported by the advisory committee to the graduate dean (S3 Form). If not otherwise registered for courses on campus, a student must be enrolled for "examination only" during the semester or session in which the final examination is taken. If a student fails the exam twice, he or she may petition the academic unit for permission to retake the exam a third time. No student is allowed to take the final exam more than three times.

EdD DEGREE: EdD candidates must have either the master of arts in education, master of education, or the quantitative and qualitative equivalent of one of these from an accredited college or university. See **EdD Degree Regulations** under **Degree Requirements**.

Progress through the program is reported to the Graduate School by submission of a series of forms (D Forms), that may be obtained from the academic unit.

The program of study, determined by the major adviser in cooperation with a doctoral advisory committee, is a well-organized plan of professional specialization in one of the major fields of education. A minimum of 72 semester hours above the bachelor's degree is required. During the semesters in which the student establishes an "in-residence" presence at MU, the student may not be employed at MU for more than half-time teaching. With the approval of the advisory committee and the dean of the Graduate School, graduate work completed in other institutions with recognized graduate schools may be accepted toward the degree requirements. The program of study must be filed with the Graduate School at least one month before the matriculation examination. All course work must be completed within an eight-year period. (This excludes work toward the master's degree, its equivalent or the EdSp degree.)

A candidate majoring in some aspect of educational administration and supervision, or in a special field of teaching, who has not had acceptable experience in the field may be required (as part of the program of studies) to work one semester as an intern. This internship, supervised by the major adviser, is conducted in a setting approved by the academic unit. Not more than 12 semester hours may be granted for the internship. Only students who have completed a minimum of 12 hours beyond the MA or M Ed degree (or the equivalent) are eligible for internship credit in administration.

A matriculation examination must be taken no earlier than the second year of graduate work. The examinations are administered in early March and early October each year. Consult the departmental director of graduate studies for the annual schedule of deadlines for graduate students. If not otherwise registered for courses on campus, a student must be enrolled for "examination only" during the semester or session in which the examination is taken.

The matriculation examination includes the candidate's major fields of interest and is conducted by the major adviser and the doctoral program committee. The candidate will be advised to pursue further graduate study if results of the examination so indicate. The committee must vote to pass the student with no more than one dissenting vote. The matriculation examination must be completed successfully at least seven months before graduation. The student who fails may not retake the examination for at least 12 weeks. Failure on two examinations automatically prevents candidacy.

Before the matriculation examination, the candidate must give satisfactory evidence of sufficient knowledge of statistics and educational research techniques to understand and use research reports in the field of education. To satisfy this requirement, the student must demonstrate competence at the level of a grade of "A" or "B" in a 12 credit hour research methods sequence beyond the introductory statistics course (A354 Introduction to Educational Statistics). This sequence includes the following courses: A454 Quantitative Foundations of Educational Research I, A456 Qualitative Foundations of Educational Research I, an academic unit inquiry course, and A458 Educational Planning and Evaluation. Exceptions to one or more of the research foundations courses must be approved by the departmental director of graduate studies using a determination of equivalence form. Foreign language is not required unless the candidate's program committee decides otherwise.

Before beginning dissertation research, the doctoral advisory committee must approve the research proposal. A final oral examination on work included in the dissertation is required. This examination is conducted by the major adviser and the doctoral advisory committee and reported to the Graduate School.

PhD DEGREE: The program for the degree of doctor of philosophy (PhD) with a major in education, a research degree, is based on work for a master's degree in education or the equivalent. Progress through the program is reported to the Graduate School by submission of doctoral forms (D Forms), which can be obtained in the academic unit.

A minimum of 72 semester hours beyond the bachelor's degree is required. During the semesters in which "in-residence" is established at MU, the student may not be employed at MU for more than half-time teaching without the approval of the major adviser and the dean of the Graduate School. Graduate work completed at other institutions with recognized graduate schools may be accepted toward the degree requirements. The program of study must be submitted to the Graduate School at least one month

before the comprehensive examination. All course work must be completed within an eight-year period. (This excludes work toward the master's degree, its equivalent or the EdSp degree.)

A comprehensive examination must be taken no earlier than the second year of graduate work. The examinations are administered in the fall and spring each year. If not otherwise registered for courses on campus, a student must be enrolled for "examination only" during the semester or session in which the comprehensive examination is taken. The comprehensive examination must be completed successfully at least seven months before graduation. Before the examination, candidates for the PhD in education must demonstrate competence in the area of research by completing (with a grade of "A" or "B") a 12 credit hour research methods sequence beyond the introductory statistics course (A354 Introduction to Educational Statistics). This sequence includes 12 credit hours selected from the following list of courses: A454 Quantitative Foundations of Educational Research I, A455 Quantitative Foundations of Educational Research II, A456 Qualitative Foundations of Educational Research I, A457 Qualitative Foundations of Educational Research II, an academic unit inquiry course, and a research elective course. Exceptions to one or more of the research foundation courses must be approved by the departmental director of graduate studies.

Before beginning the dissertation research, the doctoral advisory committee must approve the research proposal. The dissertation offered in partial fulfillment of the requirements must give evidence of satisfactory mastery of the technical instruments and research procedures in the field of education. A final oral examination on work included in the dissertation is required. The examination is conducted by the major adviser and the doctoral advisory committee and the results reported to the Graduate School.

Educational and Counseling Psychology

College of Education
16 Hill Hall (573) 882-7731, Fax: [573] 884=5989
e-mail: ecpgrad@coe.missouri.edu
http://www.coe.missouri.edu/~ecp/

FACULTY

Dennis M. Kivlighan Jr., chair, professor, PhD, Virginia Commonwealth University.
Richard H. Cox, director of graduate studies, professor, PhD, University of Oregon.
John W. Alspaugh, professor, EdD, University of Missouri-Columbia.
Norman C. Gysbers, professor, PhD, University of Michigan.
P. Paul Heppner, professor, PhD, University of Nebraska.
Joseph A. Johnston, professor, PhD, University of Michigan.
James R. Koller, professor, PhD, University of Missouri-Columbia.
Steven J. Osterlind, professor, PhD, University of Southern California.
Craig L. Frisby, associate professor, PhD, University of California, Berkeley.
Glenn E. Good, associate professor, PhD, Ohio State University.
Mary J. Heppner, associate professor, PhD, University of Missouri-Columbia.
CarolAnne M. Kardash, associate professor, PhD, Arizona State University.
Richard T. Lapan, associate professor, PhD, University of Utah.
Laurie B. Mintz, associate professor, PhD, Ohio State University.
Karen D. Multon, associate professor, PhD, Loyola University of Chicago.
C. David Roberts, research associate professor, PhD, University of Arizona.
Helen J. Roehlke, associate professor, EdD, University of Missouri-Columbia.
Rick J. Short, associate professor, PhD, University of North Carolina at Chapel Hill.
John F. Kosciulek, assistant professor, PhD, University of Wisconsin-Madison.
Richard T. McGuire, assistant professor, PhD, University of Virginia.
Michael Mobley, assistant professor, PhD, Penn State.
Helen A. Neville, assistant professor, PhD, University of California, Santa Barbara.
Helena P. Osana, assistant professor, PhD, University of Wisconsin-Madison.
Roger L. Worthington, assistant professor, PhD, University of California, Santa Barbara.
Deborah L. Carr, visiting assistant professor, PhD, University of Missouri-Columbia.
Robert L. Burton, professor emeritus, EdD, University of Oklahoma.
Richard B. Caple, professor emeritus, EdD, Teachers College, Columbia University.
Corrine S. Cope, professor emeritus, PhD, The Ohio State University.
Richard A. English, professor emeritus, PhD, University of Arizona.
Paul T. King, professor emeritus, PhD, Pennsylvania State University.
Joseph T. Kunce, professor emeritus, PhD, University of Missouri-Columbia.
John F. McGowan, professor emeritus, PhD, University of Missouri-Columbia.
Michael J. Patton, professor emeritus, PhD, The Ohio State University.
Richard W. Thoreson, professor emeritus, PhD, University of Missouri-Columbia.
Frank E. Wellman, professor emeritus, PhD, University of Nebraska.
Robert R. Trimble, associate professor emeritus, PhD, Oklahoma State University.
Virginia R. Wheeler, assistant professor emeritus, PhD, University of Missouri-Columbia.

DEGREES: MA, MEd, EdSp or PhD in educational and counseling psychology in the following emphasis areas: counseling psychology (APA approved), educational psychology and school psychology.

The PhD program in counseling psychology is accredited by the American Psychological Association (APA). The master's specialization in rehabilitation counseling is accredited by the Council on Rehabilitation Education (CORE).

The graduate program in the Department of Educational and Counseling Psychology is designed to meet the specific needs of the student in a particular area of emphasis. Graduates find employment in a wide range of settings, including colleges and universities, public schools, agencies, clinics, hospitals, business and industry, rehabilitation centers, research laboratories and government service.

See **Education** for general information.

GENERAL ADMISSIONS POLICY: The department requires the following materials from the applicant: 1) Department Application Form (Personal Data Sheet); 2) three letters of recommendation; 3) a recent score report from the Graduate Record Examination (GRE), which must be no more than five years old; and 4) an official transcript of all previous course work.

MASTER'S/EDUCATIONAL SPECIALIST: A minimum undergraduate GPA of 3.0 is required. As well, a combined GRE verbal and quantitative score of 1000 or higher is preferred. If an applicant is admitted but does not hold a bachelor's degree in a related discipline or does not have relevant background course work, the applicant must complete prerequisite courses as specified by the faculty of the department.

DOCTORAL: For admission to any of the doctoral programs in the department, a combined GRE verbal and quantitative score of 1200 or higher is preferred.

For applicants (Masters, Ed Specialist, and PhD) whose first language is not English, a paper based TOEFL score of 580 is preferred (237 computer based).

For additional information write or call the Director of Graduate Studies in Educational and Counseling Psychology, 16 Hill Hall, Columbia, MO 65211, (573) 882-7732.

COURSES

A205—Learning and Instruction (2). The nature of human learning processes with implications for instruction. Emphasis on bases of and readiness for learning, types of learning, memory forgetting and transfer, and related topics. Prerequisites: Psychology 1 or 2. cor.

A207—Child Development (2). The psychological, intellectual, social, and physical development of children. Prerequisites: Psychology 1 or 2. cor.

A208—Adolescent Development (2). The psychological, intellectual, social and physical development of adolescents. Prerequisite: Psychology 1 or 2. cor.

A225—African-American Psychology (3). (same as Black Studies 225). The research, theories and paradigms developed to understand the attitudes, behaviors and psychosocial realities of African-Americans are discussed. Prerequisite: Psychology 1.

A226—Black Feminism (3). (same as Black Studies 226). This course outlines the basic principles and practices of Black feminism in the United States. Examination of the multiple systems of oppression on Black women's lives and Black women's collective actions against social structures will occur. Prerequisites: Psychology 1 or instructor's consent.

A280—Educational Measurement (2). Basic concepts of standardized testing, evaluation techniques, and interpretation of test scores for the improvement of the instructional process. Prerequisites: Psychology 1 or 2. cor.

A300—Problems (1-3). Prerequisite: instructor's consent.

A301—Foundations of Educational Psychology (3). A survey course covering learning, development, and measurement. Prerequisites: Psychology 1 or 2.

A310—Seminar (1-3). Prerequisite: instructor's consent.

A320—Foundations of Counseling Psychology (3). Survey of contemporary theories underlying both individual and group practice in counseling. Introduction to professional and ethical issues in counseling psychology. Prerequisites: departmental consent.

A321—Parent Counseling and Consultation (3). For personnel working with parents in professional settings. Examines current family needs and child-rearing practices. Basic skills in diagnosis, counseling, consultation, parent education are developed. Prerequisite: A320.

A322—School Guidance Programs (3). Provides knowledge and skills in the development and management of school guidance programs including program planning, structuring, implementing, and evaluating. Prerequisite: A320.

A323—Interviewing and Counseling (3). Study of beginning interviewing and counseling skills applied to helping relationships in human services professions. Emphasis placed on learning helping skills in small group format. Lab required. Prerequisites: Psychology 1, 2 or 20.

A350—Readings (1-3). Prerequisite: instructor's consent.

A354—Introduction to Educational Statistics (3). Introduces statistical techniques employed in education, including descriptive statistics, correlation, simple regression and hypothesis testing. cor.

A361—Foundations of Rehabilitation (3). The vocational and independent living rehabilitation system for disabled persons. Concept of disability, its social psychological implications, and techniques of preparing disabled persons for adult adjustment. Prerequisites: Psychology 1 or 2.

A365—Alcohol Abuse and Rehabilitation I (3). Covers historical perspective, definition and measurement of the problem, classifications and theories about the etiology of alcoholism. Prerequisites: A320 or A361 or instructor's consent.

A372—Career Resources in Business and Industry (2-4). Personnel practices, occupational requirements, and career opportunities and resources in business and industry. Applications are emphasized through on-site visits and use of business-industry-labor personnel. Prerequisites: A471 or instructor's consent. S/U graded only.

A373—Theory and Practice in Career Psychology (3). Methods and programs for facilitating the career development of individuals over the life span. Organization and development of activities and programs for all ages emphasized. Prerequisite: A471.

A381—Measurement of Cognitive Abilities (3). Analysis of the function of psychological testing and a critical examination of various achievement, aptitude, and intelligence assessment instruments. Prerequisite: A380.

A400—Problems (1-3). Prerequisite: instructor's consent.

A407—Advanced Child Development (3). Psychological development from birth to adolescence. Examines the influence of maturation and learning upon the acquisition of normal development tasks. Emphasizes the application of current research and theory with the school-age child. Prerequisite: A301.

A408—Advanced Adolescent Development (3). Analysis of normal adolescent psychological development, including the cognitive, affective, academic, physiological, moral and social parameters. Applications with typical adolscent problems are emphasized. Prerequisite: A301.

A409—Overview of Educational Research (3). This course is a survey of educational research design and methods of data collection for Master's and Specialist's candidates. Doctoral candidates should take the required departmental inquiry course instead of A409. Prerequisite: A354 or equivalent.

A410—Seminar (1-3). Prerequisite: instructor's consent.

A411—Advisor's Seminar (1). Prerequisite: departmental consent.

A413—Role and Function of the School Psychologist (3). Introduction to major helping relationship approached in School Psychology, applied to various professional settings. History, current issues, trends, professional organizations, legal- ethical standards, discussed. Prerequisites: enrollment in E&CP School Psychology Program.

A417—Advanced Human Learning (3). A study of behavioral and cognitive theories of learning with an emphasis on those greatest utility for educators. Experimental evidence forming the theoretical base for educational practice is examined. Prerequisite: A205 or A301 recommended.

A418—Applications of Human Learning Principles (3). Examination and evaluation of contemporary research related to motivation learning strategies and instructional psychology. The emphasis is on relating current research to contemporary educational practice. Prerequisites: A417 or consent of instructor.

A420—Counseling Methods and Practices (3). Introduction to major theoretical orientations to the counseling process and techniques; laboratory experience in case conceptualization and counseling skills. Prerequisite: A320.

A421—Counseling With Children (3). Examines various therapeutic approaches for the amelioration of such childhood problems as depression, withdrawal, hysteria, phobias, aggression, and overdependence. Includes laboratory experiences. Prerequisite: A420.

A422—Behavioral Therapy With Children (3). Treatment of abnormal behavior through the utilization of behavioral approaches to therapy with children and adolescents. Design, implementation, and evaluation of individual and group procedures. Prerequisites: A418 and A420.

A424—Marriage and Family Counseling (3). Appropriate for students who work with couples and families in a professional setting. Examines major family and marriage theories and research, counseling, skill development communication, and marital/family enrichment. Prerequisite: A420.

A425—Counseling Psychology Practicum (3-6). Supervised practice of counseling in an approved counseling setting. Prerequisites: A420, A480, A371 and departmental consent. S/U graded only. May be repeated.

A426—School Psychology Practicum (3-6). Supervised practice of psychological assessment, intervention and remediation strategies. Prerequisites: A381, A421 or A422, A481 and departmental consent. S/U graded only. May be repeated.

A427—Practicum in Marriage and Family Counseling (3-6). Supervised practice in marriage and family counseling conducted in appropriate laboratories and agencies. Prerequisites: A425 or A426, and A423 or A424, and departmental consent. S/U graded only.

A428—Studies in Supervision (3). Instruction and practice in the supervision of counseling conducted in appropriate laboratories and agencies. Prerequisites: A425 or A426 and instructor's consent.

A430—Advanced Counseling Theories (3). Historical and contemporary theories of counseling. Advanced study of techniques, and research findings. Prerequisites: A425 or A426.

A431—Biofeedback in Psychological Practice (3). Use of biofeedback in achieving voluntary self-regulation and control of stress related behaviors. Prerequisites: A425 or A426 and instructor's consent.

A432—Psychoanalytic Counseling (3). A study of the contribution of classical and contemporary psychoanalysis to counseling theory, research and practice. Examination of theoretical and clinical material in a seminar format. Prerequisites: A425 or A426 and instructor's consent.

A433—Psychological Consultation (3). The psychological consultation process between the mental health professional and applied settings, including schools, agencies, and hospitals. Techniques, models, research roles, and responsibilities are discussed. Prerequisites: A425 or A426.

A435—Ethical and Legal Issues in Psychological Practice (3). Legal and ethical concepts and issues relevant to the practice of psychology and student personnel services. Prerequisites: A320 or instructor's consent.

A436—Multicultural Issues in Counseling (3). This course covers the research and theories of counseling racial/ethnic minorities and gays, lesbians, and bisexuals in the U.S. Examination of personal values and education about the interrelationship between race, class, gender, and sexuality are accomplished via structured activities. Prerequisite: A425 or A426.

A437—Social and Cultural Identity Development (3). Graduate-level course designed to introduce students to: (a) the dominant social and cultural identity theories and paradigms; (b) how these theories have been operationalized and measured.

A438—Gender Issues in Counseling and Education (3). Topics include conceptions of gender roles, measurement of gender-related constructs, gender role socialization process, high incidence gender-related problems, and psychoeducational and counseling interventions. Prerequisite: instructor's consent.

A439—Multicultural Counseling Competencies (3). Theory, research, assessment, and clinical practice in multicultural counseling.

A440—Foundations of Student Development (3). (same as Higher and Adult Education K462). History, philosophy theory, and issues pertinent to student affairs work. Prerequisites: A320 or instructor's consent.

A441—Design and Management of Student Development Programs (3). (same as Higher and Adult Education K463). Emphasis on program development and research methodology and application. Prerequisites: A440 or Higher & Adult Education K462.

A442—Practicum in Student Development Programs (3). Supervised practice in student personnel services in an approved agency. Prerequisites: A440 or Higher & Adult Education K462. S/U graded only.

A443—Rehabilitation Counseling Internship (3-9). Field-based counseling internship in a community setting serving individuals with disabilities. 600 hour supervised experience designed to combine theoretical and applied program training aspects. Prerequisites: A425, A463, and A486. Graded on S/U basis only. f,w,s.

A445—Sport Psychology (3). Current topics of research in sport psychology are examined. Topics include: sport personality, attention, activation and anxiety intervention, motivation, sport aggression, audience effects, team cohesion, leadership, and health psychology. Prerequisite: Psychology 1.

A446—Sport in America (3). Sociological perspectives of sport in America. Attention given to the influence of society on sport as in institution, and the role of sport as an agent of social change. Prerequisite: Sociology 1 or Psychology 1.

A450—Research (3-6). Supervised research for masters and specialist degree. Prerequisite: departmental consent.

A451—Methods in Group Counseling (3). Study of group counseling methods and techniques. Participation in a group is required. Prerequisite: A351.

A452—Practicum and Theory in Group Counseling I (4). Supervised practice of group facilitation in an approved setting. Formal study of contemporary theories and advanced techniques is integrated with the practice of group facilitation. S/U graded. Prerequisites: A451 and instructor's consent.

A453—Practicum and Theory in Group Counseling II (4). A continuation of A452. S/U graded. Prerequisites: A452 and instructors consent.

A454—Quantitative Methods in Educational Research I (3). Topics include simple linear regression, multiple regression, introduction to matrix algebra, partial and semipartial correlation, multiple regression for prediction, hierarchical modeling, polynomial regression, and regression analysis with categorical and continuous property independent vari-

ables. Prerequsiite: A354.

A455—Quantitative Methods in Educational Research II (3). This course focuses on analysis of variance (ANOVA) and includes the following topics: Simple analysis of variance with follow-up comparisons, factorial designs and follow-up comparisions, repeated measures design, analysis of convariance, nesting, multivariate analysis of variance (MANOVA), factorial MANOVA, and discriminant analysis. Prerequisite: A454.

A456—Qualitative Methods in Educational Research I (3). An introductory course intended to provide a broad understanding of the foundations, purposes, and principles of qualitative research in education, as well as an introduction to a variety of qualitative research designs, data collection methods, and analysis strategies. Prerequisite: A354.

A457—Qualitative Methods in Educational Research II (3). The focus of each section of this course would be in-depth study of a specific method (e.g., case study, ethnographic, grounded theory) and various approaches (e.g., critical theory, dialogical). Students will be expected to undertake a substantive pilot study and prepare a qualitative text. Prerequisite: A456 Qualitative Methods I.

A458—Educational Planning and Evaluation (3). This course addresses major issues and models used in educational program planning and evaluation, including the appropriate use of various evaluation models and different types of data. Prerequisite: departmental inquiry course, A454 and/or A456.

A461—Rehabilitation Counseling (3). A study of the history and current status of rehabilitation counseling, and the role, theory, and practice of counseling in rehabilitation settings with persons with disabilities. Prerequisite: A361

A462—Medical and Psychological Aspects of Disability (3). Presentation of medical aspects of major disabilities and their effects upon social, vocational, personal, and economic adjustment. Study of basic restoration and accommodating services. Prerequisite: A361.

A463—Vocational Placement of Persons with Disabilities (3). Techniques of job development, placement, job analysis, transferable skill analysis, employer development. Prerequisite: A361.

A464—Scientific Fdns of Counseling Psych I: Prof Iss & Crit Thinking (3). For first-year doctoral students in an applied psychology. Includes study of research design and methodological issues in the field of counseling psychology.

A465—Scientific Foundations of Counseling Psych II: Rsrch, Dsgn & Appl (3). For first-year doctoral students in applied psychology. Includes study of research design and methodological issues in the field of counseling psychology. Prerequisite: A464 and Psychology 464.

A466—Methods and Findings in Counseling Process and Outcome Research (3). This course focuses on contemporary issues in the counseling psychology research literature and psychological writing. Prerequisites: A464/Psychology 464 and A465/Psychology 465.

A468—Professional Iss. in Sch. Psych. I:Hist., Trends & Ethical Pract. (3). For first-year doctoral students in school psychology. History, current issues, trends, professional organizations, legal-ethical standards of doctoral level school psychology are discussed. The scientist-practitioner model and scientific reasoning process as they apply to both science and practice are reviewed. Prerequisite: Must be admitted to school psychology program.

A469—Professional Iss. in Sch. Psych. II: Rsrch. Design & Application (3). For first-year doctoral students in school psychology. Includes study of research design and methodological issues in the field of school psychology. Prerequisite: Must be admitted to school psychology doctoral program.

A470—Field Experience in Counseling (3-9). Prerequisite: instructor's consent. S/U graded only.

A471—Foundations of Career Psychology (3). Theoretical orientations to counseling for career development; nature and structure of work, education, and leisure; work and family issues; career concerns of special populations; use of career information in counseling. Prerequisites: Psychology 1 or 2.

A472—Career Develpment Theory for Women (3). Consideration of the relevance of theories of career development for women, and their application to the counseling of women. Supervised clinical experience in the application of theories to counseling high school age women.

A473—Analysis of Research in Career Psychology (3). Examination of career development theories, the research supporting the theories, and the practical application of these ideas in career counseling and career programs. Prerequisite: A471.

A478—Foundations of Educational and Psychological Measurement (3). Basic principles of educational and psychological measurement including test construction, validity, reliability, item analysis, and derived scores. Prerequisites: Psychology 1 or 2 or beginning course in Statistics. Graduate standing required.

A480—Measurement of Interest and Personality (3). Interprets educational, interest, and personality test data and data in personnel records; emphasizes use of data in counseling. Prerequisite: A380.

A481—Individual Intelligence Testing (3). Limited to students with a strong background in psychology and measurement. Practice in administering and scoring the Stanford Binet Scale and Weschsler's Intelligence Test. Major emphasis on psychological interpretation. Prerequisites: A380 and instructor's consent.

A482—Psychological Assessment of Adults (3). Students develop and practice skills in writing psychological reports with special emphasis on assessing psychological social-vocational functioning. Prerequisite: A481.

A483—Psychological Assessment of Children (3). Administration, scoring and interpretation of specialized individual tests including the cognitive and perceptual motor domains. The integration of diagnostic information into comprehensive psychological reports is emphasized. Prerequisite: A481.

A484—Projective Assessment of Children (3). Administration, scoring and interpretation of individual projective methods for the appraisal of children and adolescent personality. Emphasizes comprehensive psychological reports. Prerequisites: A480 or A481.

A485—Projective Assessment of Adults (3). Assessment of personality functioning using projective and inferential testing procedures. Rudimentary skills in using the Rorschach method. Prerequisites: A480 or A481.

A486—Vocational Assessment of Persons with Disabilities (3). Assessment of vocational interests, needs aptitudes, and abilities of disabled persons. Work samples, commercial systems, job analysis, job matching systems, and measures of work personality. Lab experience. Prereq-uisites: A361 and A380.

A487—Introduction to Theory of Educational Measurement (3). (same as Educational Research and Statistics R487). Classical and modern test theory, including IRT, gereralizability theory and test bias. Also covered are advanced strategies for investigating reliability and validity. Prerequisites: A380 or equivalent and A354 or equivalent and instructor's consent.

A488—Application of Multivariate Analysis in Educational Research (3). The focus of this course will be on applications of multivariate analysis in educational research. Prerequisites: A455 or equivalent and instructor's consent.

A490—Research (1-12). Independent research leading to dissertation. Prerequisite: departmental consent. Graded on S/U basis only.

A491—Internship in Counseling Psychology (1-6). Supervised experience in counseling psychology on half- or full-time basis in approved internship station. Prerequisite: departmental consent. May be repeated. S/U graded only.

A492—Internship in School Psychology (1-6). Supervised practice in school psychology in an institutional or applied setting. Prerequisite: departmental consent. May be repeated. S/U graded only.

Educational Leadership and Policy Analysis

College of Education
211 Hill Hall (573) 882-8221, Fax: [573] 884=5714

FACULTY

Joe F. Donaldson, chair and director of graduate studies, associate professor, PhD, University of Wisconsin-Madison. Adult and continuing education.

Richard L. Andrews, dean, professor, PhD, Purdue University. New directions for preparing school leaders; leading and empowering for change; school goals, principles and achievements, instructional leadership.

Irvin W. Cockriel, professor, EdD, University of Missouri-Columbia. Student affairs; college outcomes; fund raising in higher education; merit scholarships.

Lonnie Echternacht, professor, EdD, University of Missouri-Columbia.

Peter Hall, professor, PhD, University of Minnesota.

John C. Reid, professor, PhD, University of Missouri-Columbia. Computer-based instruction design; readability of patient pamphlets.

Robert C. Shaw, professor, EdD, University of Missouri-Columbia. Enrollment forecasting, school finance; school evaluation; school accreditation.

Paula M. Short, professor, PhD, University of North Carolina-Chapel Hill. School empowerment, leadership, organizational change.

Barbara K. Townsend, professor, EdD, The College of William and Mary.

Jerry W. Valentine, professor, PhD, University of Nebraska. Middle schools.

Julie A. Caplow, associate professor, PhD, University of Iowa. Adult learning.

Patrick B. Forsyth, associate professor, EdD, Rutgers University. Educational administration.

Steven W. Graham, associate professor, PhD, University of Iowa. Higher education, continuing education.

Bruce Anthony Jones, associate professor, PhD, Columbia University. Policy.

George J. Petersen, associate professor, PhD, University of California, Santa Barbara.

Peggy Placier, associate professor, PhD, University of Arizona. Policy.

Bonnie Bourne, assistant professor, University of Missouri-Columbia.

Karen S. Cockrell, assistant professor, EdD, Oklahoma State University. Policy.

Mikyong Minsun Kim, assistant professor, University of California-Los Angeles.

Gerardo R. López, assistant professor, PhD, University of Texas at Austin.

Jay Scribner, assistant professor, University of Wisconsin-Madison.

Linda Warner, assistant professor, PhD, University of Oklahoma.

Bonnie Zelenak, assistant professor, PhD, Kansas State University.

Sharon Welch, adjunct associate professor, PhD,

Vanderbilt University.
Terry Barnes, adjunct assistant professor, Southern Illinois University.
Karl Blake Danuser, adjunct assistant professor, PhD, University of Missouri-Columbia.
Vicki Curby, adjunct assistant professor, PhD, University of Missouri-Columbia.
Mardy Eimers, adjunct assistant professor, PhD, Syracuse University.
James Groccia, adjunct assistant professor, University of Tennessee.
Harold Jeffcoat, adjunct assistant professor, PhD, University of Kentucky.
Marilyn Miller, adjunct assistant professor, University of Kentucky.
Gary Pike, adjunct assistant professor, PhD, The Ohio State University.
Von Pittman, adjunct assistant professor, University of Georgia.
Magie Roberts, adjunct assistant professor, University of Missouri-Columbia.
Robert Stein, adjunct assistant professor, Vanderbilt University.
John Wittstruck, adjunct assistant professor, Syracuse University.
Chunsheng Zhang, adjunct assistant professor, PhD, Bowling Green State University.
Jean Zwonitzer, adjunct assistant professor, PhD, University of Missouri-Columbia.
Dan Cockrell, instructor, EdD, Oklahoma State University. Schools as organizations.
Paul L. Pitchford, research assistant professor, PhD, University of Missouri-Columbia.

DEGREES: Please write or call the department for degree information, 211 Hill Hall, Columbia, MO 65211, (573) 882-8231.

GENERAL ADMISSIONS POLICY: Admissions screening and decisions are not made until all required materials have been submitted. Admissions recommendations are based on a profile developed from data that include undergraduate (last 60 hours) and graduate grade point averages, scores on the Graduate Record Examinations (GRE), letters of recommendation, evidence of successful professional experiences, and samples of scholarly writing. Competitive scores on the GRE, taken within the past five years, are required for admission. International students are required to obtain a competitive score on the Test of English as a Foreign Language (TOEFL).
Application for admission to the department's degree programs is in addition to application to the MU Graduate School. Application materials and information about the department, its faculty and programs are available through the departmental Director of Graduate Studies: 211 Hill Hall, Columbia, MO 65211; (573) 882-8231; Fax: [573] 884=5714; e-mail: elpagrad@coe.missouri.edu.

COURSES

EDUCATION STUDIES

B350—American Schooling in its Social Contexts (3). Multidisciplinary interpretation and critical analysis of the historical, philsophic, social and political development of contemporary American education, including institutional structures, organizational patterns, policies and practices. Prerequisites: junior standing or above.
B351—Historical Foundations of American Education (3). Development of American educational institutions and ideas, and of social forces which have influenced them. Prerequisite: Junior standing or above. (cor.)
B353—Intellectual Foundations of Education (3). Analyzes, interprets, and evaluates fundamental concepts and controversial issues in contemporary education with attention to ideological and social contexts of each. Prerequisites: Junior standing or above.
B355—Sociology of Education (3). (same as Sociology 355). Contexts, structures and processes of schooling; effects on class, race, ethnicity and gender; social change, educational policy, and organizational dynamics; higher education and the economy. Prerequisite: Sociology 1 or equivalent.
B360—Topics in Educational Studies (1-99). Group and/or independent study of selected topics in the social and philosophic foundations of education. Prerequisite: instructor's consent.
B400—Problems (1-99). Prerequisite: instructor's consent.
B410—Seminar in Education Studies (1-3).
B470—International Education and National Development (3). Includes the study of comparative education from historical and theoretical perspectives; focuses upon issues related to educational planning, education and modernization, Third World development, adult illiteracy, dilemmas of foreign students, and selected case studies.
B471—Philosophic Theory in Education (3). Examines major ideological movements in modern education; their social antecedents and philosophic underpinnings.
B473—The Development of Higher Education in the United States (3). (same as Higher and Adult Education K473). A study of the transformation of the English college tradition to what higher education is currently in the United States. The emphasis is on how institutions of higher learning changed to meet the needs of the nation or failed to do so.
B481—Classic and Contemporary Educational Thought (3). Study of selected major theorists in education, past and present, whose views are of basic significance to the analysis of educational theory and practice.
B490—Research in the History and Philosophy of Education (1-99). Graded on a S/U basis only.

EDUCATIONAL ADMINISTRATION

C342—School Organization and Administration for Teachers (2). Required for teacher certification, this course addresses the issues of effective school organization and administration as these issues relate to the classroom teacher. Topics generally include school law, school finance, classroom management and job placement. Prerequisite: senior standing.
C400—Problems (1-99).
C401—Foundations of Educational Administration (3). Introductory study of Educational Administration. Designed to serve as a foundation for more specialized courses. Emphasizes history and development of administrative theory.
C404—Elementary and Secondary School Supervision (3). Organized study of the theory and practice in the field of supervision designed to meet the needs of school superintendents, principals, and special supervisors.
C406—Secondary School Administration (3). Study of the principles of secondary school organization and the role and responsibilities of the secondary school principal, particularly the high school principal. Building level administration of programs for exceptional children and multicultural issues are discussed.
C408—Elementary School Administration (3). Specialized course in elementary school administration and organization for prospective administrators and supervisors and teachers, including attention to services for exceptional children, and minority and multicultural education in the elementary school.
C410—Seminar in Educational Administration (1-3).
C411—Education Policy Analysis (3). Development of knowledge base and analytical skills for understanding the organization and control of American education at local, state, and national levels. Study of education policy impact on public schools, private schools and institutions of higher education from social, economic, and political perspectives.
C412—The Superintendency (2-3). This course covers the duties and responsibilities of the superintendent of schools and other district-wide administrators. Local, state, and federal regulations and administrative aspects of finance, school plant, staff personnel and pupil personnel including handicapped and multicultural students are studied.
C416—Seminar in Elementary School Administration and Organization (1-3). Study of current trends and issues in elementary school organization and administration, including administrative responsibilities for the education of exceptional children and multicultural concerns.
C420—Secondary School Organization and Administration (3). The investigation and application of selected topics in secondary schools, including effective principal behavior research, effective school research and administration of programs for exceptional children and multicultural concerns. Prerequisite: C406 or equivalent.
C424—School Surveys and School Facilities Analysis (4). This course provides information and field experience related to enrollment forecasting, school facility and site evaluation including special provisions for the handicapped. Aspects of school finance and elements of the school evaluation process are also covered. Includes one-hour credit for laboratory field experience.
C426—Interpersonal Communication and Conflict Resolution (3). Study of the research on and skills of interpersonal communication and conflict resolution related to the roles of school administrators at school, community, and district levels. Use is made of lecture, discussion and role playing.
C430—Junior High & Middle Schools Administration (3). Organization and administration of middle level schools, commonly referred to as intermediate, middle and junior high schools. Focus upon the administrator to implement appropriate programs for exceptional and non-exceptional pre- and early adolescents in all cultural settings.
C438—Extracurricular Activities (3). (same as Curriculum and Instruction T438). Study of cocurricular activities in schools. For sponsors and administrators.
C439—Curriculum Leadership (3). A study of research, theory, and skills necessary for curriculum leadership in educational organizations. Course includes generic curriculum management processes, design trends, controversial issues multi-media, innovative instructional techniques, and program evaluation. Prerequisite: graduate standing.
C440—Issues in School Finance (2-3). Exploration of the social, political, economic, and educational issues which influence the methods for providing financial resources for public schools at local, state, and federal levels. Includes consideration of funding needs of specific programs, such as special education. Open to all graduate students.
C441—School Budget Development and Fiscal Management (3). This course includes an overview of school finance programs of the 50 states, including special funds for exceptional children and compensatory education. Various aspects of planning, accounting, auditing, and reporting related to budget development and fiscal management are covered.
C444—Current Issues in School Administration (3). Course is designed to acquaint students with current educational issues including those related services for the exceptional child, public and non-public, elementary, secondary and post-secondary, and the development of effective administrative responses to these issues.
C448—Analysis of Coaching and Teaching (3). (same as Curriculum & Instruction T448). Teaching models and a systematic review of literature on instructional behavior and student achievement. Methodological strategies for con-

ducting naturalistic classroom research stressed. For advanced master's and doctoral students. Prerequisite: graduate standing.

C451—School Staff Personnel Administration (3). Principles and practices of modern school staff personnel administration as applied to human relations in educational institutions and programs. Affirmative action procedures, including the employment of minorities and the handicapped are studied.

C452—School-Community Relations (3). Principles of good school public relations, unique public functions of various school and community groups. Techniques for conducting school public relations.

C454—Legal Aspects of Education (3). Study of both statutory and case law pertaining to education as applicable to educational institutions and personnel, including legal theory, organization, sources, processes and effects. Includes specialized areas of legal issues, such as exceptional children, civil rights and school liability.

C456—Investigation in School Law (3). Provides opportunities to develop an in-depth knowledge of current issues in the statutory and case law related to educational institutions, their leaders, personnel and students. Special opportunities for developing legal skills. Prerequisites: C454 or instructor's consent.

C460—Topics in Educational Administration II (1-99). Group experiences in educational administration. For graduate students only.

C470—Field Experience in Educational Administration (0-9). Planned internship or practicum experiences in schools or educational agencies for administrators at school, district, or agency levels. S/U graded only.

C490—Research in Educational Administration (1-99). Graded on a S/U basis only.

HIGHER AND ADULT EDUCATION

K325—Institutional Advancement for Higher Education (3). The study of basic elements of institutional advancement for higher education including an analysis and rationale for the development or advancement function.

K360—Topics in Higher and Adult Continuing Education (1-99). Organized study of selected higher and adult continuing education topics. Topics vary semester to semester.

K377—Race, Gender and Ethnicity in Higher Education (3). (same as Black Studies, and Women Studies 377). Historical relationships of race, gender, and ethnic issues in United States higher education. Issues include: theory and research of curriculum and teaching, diversity within the the academy, and leadership, governance, and policy.

K400—Problems in Higher and Adult Continuing Education (1-99). Prerequisite: departmental consent.

K410—Seminar in Higher Education (1-99).

K411—Seminar in Adult Continuing Education (1-3).

K415—The Adult Learner (3). The identification of learning, motivation and participation patterns among adults will be examined. Learning theories and adult development lifecycle and stage research data will be explored as well as their implications for practice.

K420—Organizational Analysis of Higher & Adult Continuing Education (3). Analysis of organizational characteristics and principles in higher and continuing education. Topics include: organizational theories and models, organizational culture, communication, innovation, planning, leadership, power and influence, and external environment influences.

K425—Academic Culture and Environment in Higher and Adult (3). A study of the academic culture and environment of higher and continuing education. Topics include faculty careers and development, academic markets and trends, promotion and tenure, and evaluation of faculty.

K430—Curriculum Philosophy and Development in Higher Education (3). A study of the philosophical foundations of postsecondary curricula, current trends and issues, and approaches to curriculum reforms and revisions.

K440—Instructional Strategies for Higher & Adult Continuing Education (3). An examination of the theoretical foundations and applications of information-processing, behavioral, social, and personal instructional strategies. Emphasis on implementing the strategies and improving instruction through the use of appropriate strategies. Prerequisite: K415.

K441—Program Planning in Higher and Adult Continuing Education (3). Analysis of program planning and evaluation in higher and continuing education. Topics include: conceptualizations of program planning, situational analysis, needs assessment, priority setting, marketing and promotion, and program evaluation. Prerequisite: K415.

K460—Topics in Higher and Adult Continuing Education (1-99).

K462—Foundations of Student Affairs Administration (3). (same as Educational and Counseling Psychology A440.)

K463—Student Affairs Administration: Methods & Programs (3). (same as Educational and Counseling Psychology A441.)

K465—The Community College (3). A study of the history, role, and functions of the community college and the problems and issues facing the institutions.

K466—College Student Culture and Environment (3). A study of the American College student and aspects of the college environment that impact students. Topics include student development, college outcomes, returning adult and computer students, and aspects of the college environment.

K468—College Teaching (2-3). Primarily for students who expect to teach in junior or senior colleges. Principles and practical issues in college teaching are considered.

K473—History of Higher Education in the United States (3). A study of the transformation of the English college tradition to what higher education is currently in the United State. The emphasis in on how institutions of higher learning changed to meet the needs of the nation or failed to do so.

K475—Administration & Governance of Higher Adult Continuing Education (2-3). Considers problems of organization and administration in institutions of higher education.

K477—Budget and Finance in Higher and Adult Continuing Education (3). Fiscal planning and management in higher and continuing education. Topics include budgeting, financial planning, fiscal management, state and federal policy influences, and fiscal management's relation to other administrative functions.

K480—Internship in Higher and Adult Continuing Education (1-99). Internship experience in preapproved practical work locations. Prerequisite: departmental consent.

K490—Research in Higher and Adult Continuing Education (1-99). Prerequisite: departmental consent. Graded on a S/U basis only.

Electrical Engineering

College of Engineering
349 Engineering Building West (573) 882-6387

FACULTY—Columbia

Kai-Fong Lee, chair, professor, PhD, Cornell University.

Andrew J. Blanchard, director of research, professor, PhD, Texas A&M University.

Kenneth Unklesbay, director of graduate studies, professor, PhD, University of Missouri-Columbia.

Robert W. Leavene, director of undergraduate studies, associate professor, PhD, University of Missouri-Columbia.

William D. McFarland, professor, PhD, University of Missouri-Columbia.

Jon Meese, professor, PhD, Purdue University.

William C. Nunnally, professor, PhD, Texas Tech University.

Sherman, professor, PhD, University of Missouri-Columbia.

Charles R. Slivinsky, professor, PhD, University of Arizona.

Michael J. Devaney, associate professor, PhD, University of Missouri-Columbia.

Huber L. Graham, associate professor, PhD, Massachusetts Institute of Technology.

Chun-Shin Lin, associate professor, PhD, Purdue University.

Robert O'Connell, associate professor, PhD, University of Illinois.

Chang Wen Chen, assistant professor, PhD, University of Illinois.

Randy Curry, assistant professor, PhD, University of St. Andrew.

Kevin Gillis, assistant professor, PhD, Washington University.

Greg Engel, assistant professor, PhD, Texas Tech University.

Gayle E. Adams, professor emeritus, PhD, University of Wisconsin.

Robert L. Carter, professor emeritus, PhD, Duke University.

Cyrus O. Harbourt, professor emeritus, PhD, Syracuse University.

Richard G. Hoft, professor emeritus, PhD, Iowa State University.

Robert W. McLaren, professor emeritus, PhD, Purdue University.

James R. Tudor, professor emeritus, PhD, Illinois Institute of Technology.

Rex A. Waid, professor emeritus, PhD, University of Wisconsin.

Donald L. Waidelich, professor emeritus, PhD, Iowa State University.

Edward J. Vredenburgh, associate professor emeritus, MS, University of Missouri-Columbia.

Ronald R. Berliner, adjunct associate professor, PhD, University of Illinois.

John W. Farmer, adjunct associate professor, PhD, Kansas State University.

Paul Gader, adjunct associate professor, PhD, University of Florida.

Michael Jurczyk, adjunct assistant professor, PhD, University of Stuttgart.

James M. Keller, adjunct professor, PhD, University of Missouri-Columbia.

Wayne C. McDaniel, adjunct associate professor, PhD, University of Missouri-Columbia.

Hongchi Shi, adjunct assistant professor, PhD, University of Florida.

Harry W. Tyrer, adjunct professor, PhD, Duke University.

Yunxin Zhao, adjunct assistant professor, PhD, University of Washington-Seattle.

Xinhua Zhuang, adjunct professor, PhD, Peking University-China.

FACULTY—Coordinated Engineering Program, Kansas City

Ghulam M. Chaudhry, associate professor, PhD, Wayne State University.

Curt Davis, associate professor, PhD, University of Kansas.

Mohsen Guizani, associate professor, PhD, Syracuse University.

Jerome Knopp, associate professor, PhD, University

of Texas-Austin.

David G. Skitek, assistant professor, PhD, University of Arizona.

DEGREES: MS and PhD in electrical engineering

INTERDISCIPLINARY AREA PROGRAMS: MS and PhD in nuclear engineering

Areas of study include signal processing and wireless communication, antenna design and remote sensing, artificial intelligence, automatic control, computer communication, VLSI fabrication, optoelectronics, semiconductor devices, physical electronics, information systems, integrated circuits and systems, digital computer systems and power electronics and biomedical engineering. Excellent computer equipment and other laboratory facilities, all within the Engineering Building West, are used for applied research sponsored by various government and industry sources. Two major initiatives of the department are telecommunications and electromagnetic applications.

Graduate application deadlines: February 15 for fall semesters and September 1 for winter semesters.

Applications received after these deadlines will be evaluated as time allows. Teaching and research assistantships are available to qualified students. Applications should be submitted by Feb. 15.

Additional information can be obtained from the Graduate Division of the Department of Electrical Engineering, 211 Engineering Building West, Columbia, MO 65211.

MASTER'S DEGREE, THESIS AND NON-THESIS OPTION: Admission to the Graduate School requires a GPA of 3.0 (A=4.0) for the last 60 hours of undergraduate study. Acceptance for advisement in the Department of Electrical Engineering is based on a 3.0 or higher GPA in all undergraduate study and satisfying the following additional requirements:

- Graduate Record Examination (GRE) quantitative score of at least the 80th percentile
- Test of English as a Foreign Language (TOEFL) score of at least 550 (for international students only)
- Submission of three letters of recommendation from persons familiar with the applicant's engineering or related work
- Submission of a written statement of research interests describing applicant's career goals and area of technical interest

To fulfill the requirements for the MS degree, a candidate must complete 30 hours, including at least 15 hours of 400-level course work. A maximum of six hours of graduate credit may be transferred from another campus in the University of Missouri System or other university. A maximum of eight hours of graduate credit may be used from a previous master's degree. All students must complete at least one but not more than three credit hours of 410 Seminar. At least 24 hours of course work, exclusive of seminar and research or problems, are required. At least three hours of research or problems are required. The student's overall GPA must be at least 3.0. The master's degree must be completed within eight years of initial enrollment. Each candidate must pass a final oral examination to demonstrate mastery of the work included in the thesis or in a substantial independent project.

DOCTORAL DEGREE: A student who meets the following requirements may be accepted for advisement in the department's doctoral program:

- Holds the equivalent of an MS degree in electrical or computer engineering
- GRE quantitative score of at least the 90th percentile
- TOEFL score of at least 550
- A 3.4 or better grade point average (A=4.0) on the first 24 hours of previous graduate work, exclusive of thesis, seminar or individual problems credit
- Submission of three letters of recommendation from persons familiar with the applicant's engineering or related work and
- Submission of a written statement of research interests

Consideration in doctoral program admissions is given to the applicant's grade trends, experience and maturity, and to the availability of expertise in areas of the applicant's technical interest.

To be accepted as a PhD candidate, the student must have completed the equivalent of an MS in electrical or computer engineering and prove competency in a written qualifying examination conducted by a PhD qualifying committee.

The doctoral program committee sets the total hours; at least 72 semester hours beyond the BS are required. Research on the doctoral dissertation is expected to be of quality acceptable for publication in a journal.

The candidate must pass a written and oral comprehensive examination, complete a doctoral dissertation on a topic approved by the committee and defend the dissertation in an oral final examination.

INTERDISCIPLINARY AREA PROGRAMS: MS and PhD in nuclear engineering

Graduate study, designed to prepare students for research and advanced design work in industry and for university research and teaching, provides opportunities for theoretical study and for experimental work in several major areas. A strong research connection also exists between electrical engineering and the Medical Informatics Group at MU with joint projects in medical image analysis, fuzzy logic and medical decision making.

COURSES

Course numbers followed by K are offered through the Coordinated Engineering Program at the University of Missouri-Kansas City.

205—Circuit Theory II (3). Continuous and discrete systems analysis; discrete and continuous convolution techniques. Prerequisite: CECS 103, Engineering 124, and Mathematics 304.

206—Feedback Theory (3). Feedback system analysis. System modeling methods, performance specifications, construction, and use of root-locus, Bode plots, and Nyquist diagrams. Continuous and Discrete systems are treated in parallel. Prerequisites: 216

216—Transform Analysis of Signals and Linear Systems (3). Transform Analysis of Signals and Linear Systems. Laplace transforms, z-transforms, Fourier series and transforms. Prerequisite: EE 205.

225—Electromagnetic Fields (3). Elements of vector analysis, electrostatics, magnetostatics, and time-varying fields, plane waves. Prerequisites: Physics 176 and Mathematics 304 concurrently.

226—Logic Design (4). Digital electronics, chip level design, algorithmic state machines, microprocessor architecture and interfacing, and digital system design methodology. Lecture and lab. Prerequisites: Engineering 126.

235—Semiconductors and Devices (3). Crystal structure; quantum aspects of energy, radiation and matter; quantum mechanics and energy bands in solids; electronic and optical properties of semiconductors; p-n junctions and diodes; bipolar and field-effect transistors. Prerequisites: EE 225.

266—Power Engineering I (4). Real and reactive power in single-phase and polyphase AC circuits; magnetic circuits; transformers; introduction to power transmission and distribution; introduction to electromechnical energy conversion; mechanically commutated DC machines; synchronous and asychronous AC machines. Lecture and lab. Prerequisite: Engineering 124 and EE 154 or equivalent.

286—Electronic Circuits and Signals I (4). Electron Devices, modeling and applications to basic electronic circuits, including RC amplifiers and power supplies. Prerequisite: EE 154 and Corequisite: EE 205.

296—Electrical Engineering Projects Laboratory (2). Open ended design projects which encourage innovative solutions to design and measurement problems. Students will complete projects from different areas. Special emphasis on written and oral presentation. Prerequisites: at least two of the following: EE 226, 266 and 286. Corerequisite: Statistics 320.

300—Problems (2-4). Analytical or experimental problems pertaining to electric circuits, machines, fields or electronics. Prerequisites: 12 hours Electrical & Computer Engineering credit or instructor's consent.

301—Topics in Electrical Engineering (3). Current and new technical developments in electrical engineering. Prerequisite: senior standing or equivalent.

304—Digital Computer Applications in Engineering (3). (same as Chemical Engineering 304, Mechanical and Aerospace Engineering 304).

307—Introduction to Digital Signal Processing (4). Concepts, analytical tools, design techniques used in computer processing of signals; signal representation, sampling, discrete-time systems analysis, recursive and non-recursive filters, design/implementation, discrete Fourier transform. Prerequisites: EE 154, 216 and CECS 126.

309—Robotic Control And Intelligence (4). Introduces robotics; robot system charactersitics; robot motive power systems; geometric structure of robots; sensors and feedback; control applications and algorithms; data acquisition and output actuation function; robots and AI; microprocessor applications. Lecture and Laboratory. Prerequisites: 206, 226 and 286 concurrently.

315—Energy Systems and Resources (3). (same as Mechanical & Aerospace Engineering 315 and Nuclear Engineering 315) Analysis of present energy usage in Missouri, USA and the world, evaluation of emerging energy technologies and trends for the future. Economics and environmental impact of the developed technologies. Prerequisite: Engineering 99 or equivalent.

317—Multimedia Engineering and Technology (4). (same as Computer Engineering and Computer Science 366). Survey of multimedia applications. Capture, coding, storage, transmission, and software tools for developing productions

involving text, graphics, images, animation, sound and video. Term projects. Lecture and laboratory. Prerequisites: 226 and 216.

326—Microcomputer Architecture and Interfacing (4). (same as Computer Engineering & Computer Science 326). Advanced microprocessor architecture and programming; special interface devices, such as memory controllers, disk controller, I/0 processors, terminal controllers, communication interfaces, coprocessors. Prerequisite: 226.

328—Design of Digital Subsystems (3). (same as Computer Engineering & Computer Science 328). Design techniques including module definition, functional partitioning, hardware design language descriptions and microprogramming; design examples include arithmetic units, programmable controllers, and microprocessors. Prerequisite: 226.

330—Electronic Circuits and Signals II (3). Advanced study of electronic devices including frequency response of amplifiers, nonlinear effects in transistor amplifiers, oscillators, and feedback amplifiers. Prerequisites: EE 216 and 286.

331—Physical Electronics (3). Introduction to physical principles of semiconductors and semiconductor devices; gas, solid state, and semiconductors lasers; electro-optics; plasma physics and gaseous electronics; materials interaction with electric and magnetic fields. Prerequisite: EE 225.

332—Introduction to Optical Electronics (3). Principles, devices and materials used to generate, modulate, and detect optical radiation. Review of important properties of light and semiconductors. Light-emitting diodes and lasers. Electro-optic modulation. Thermal and quantum detection. Emphasis on semiconductor-based devices and application to fiber-optical communications. Prerequisite: 235.

333—Semiconductor Device Theory (3). Band theory, equilibrium and non-equilibrium semiconductor electronics, junction theory, p-n junction devices, bipolar and field effect transistors including SPICE simulation. Prerequisite: 235.

334—Microelectronic Fabrication (4). Basic silicon integrated circuit fabrication processes, basic techniques of wafer processing, economics of fabrication and resulting devices properties, interdependence of process flow and device design. Accompanying laboratory. Prerequisite: EE 235.

336—Power Electronics I (4). Power electronic device characteristics, important circuit and component concepts, loss mechanisms and thermal analysis, phase controlled rectifiers, dc-dc converters, and dc-ac inverters. Includes laboratory projects. Prerequisites: EE 235 and 286.

337—Pulsed Power Engineering (3). Concepts of energy generation and storage systems used in pulse power engineering, high power opening and closing switches, high voltage engineering, grounding and shielding, high voltage safety. Prerequisite: EE 225.

340—Photonics (3). Introduction to the physical principles and optical materials used in diagnostics, optical communications, semiconductor and solid state lasers, optical fiber transmissions, optical detectors, optical signal processing. Prerequisite: EE 225.

345—Electromechanical Converstion I (4). Theory and applications of electric machinery. Steady state and transient performance analysis of AC and DC electrical machines with emphasis on internal electromagnetic phenomena. Fundamentals of electronic speed controls. Prerequisite: EE 266.

346—Introduction to Nuclear Reactor Engineering (3). (same as Mechanical & Aerospace Engineering 346 and Nuclear Engineering 346). Engineering principles of nuclear power systems, primarily for the production of electrical energy. Prerequisites: Engineering 85, 99 or equivalent.

356—Control Systems Laboratory (1). Experiments in computer process control and industrial automation; automated process modeling; control algorithm design; control simulation; direct digital real-time control; transducers; computer interfacing; industrial control mechanisms; Programmable Logic Controllers. Prerequisites: EE 206, 226, 296.

358—Automatic Control System Design (3). Techniques for feedback system design and analysis; compensation using root locus and frequency-domain methods; state-variable design methods; techniques for nonlinear systems analysis and design; sample-data control systems. Prerequisite: EE 206.

359—Computer Process Control (3). Role of digital computer in process control; digital controller design; computer interfacing; transducers; programmable logic controllers; process modeling; introduction to robotics. Prerequisites: EE 206 and 226.

361—Introduction to Power Systems (4). Introduces concepts of equipment, regulation, trade terms and engineering economics applications to power systems. Prerequisite: 266.

372—Communications Systems (3). Concepts of communication systems, signal analysis and power spectrum density, signal transmission and filtering, linear modulation, exponential modulation, sampling, baseband digital communication, modulated digital communication, spread spectrum communitation. Prerequistie: EE 216.

374K—Introduction to Wireless Communication System (3). Principles of wireless communication analysis and design. Digital communication basics, cellular radio, wireless PCS communications, multiple access techniques, channel coding and equalization, and standards of digital cellular/PCS systems. Prerequisites: 274K; on demand.

376—Distributed Transmission Systems (4). Theory and application of transmission systems with emphasis on transmission lines for low and high frequencies. Lecture and laboratory. Prerequisites: 154 and 225.

377—Antenna Theory and Design (3). Introduction to antenna theory and design emphasizing engineering aspects of antenna systems, transmitting and receiving antenna parameters, various wire and aperture antennas, the role of parasitic elements, reflectors, and arrays. Prerequisite: EE 225.

378—Microwave Principles (4). Maxwell's Equations, transmission lines, plane wave progagation and reflection, waveguides, resonant cavities, microwave devices and components, radiation, radio wave propagation. Lecture and laboratory. Prerequisites: EE 225 and 286.

379—Fundamentals of Acoustical Engineering (4). Fundamental concepts of sound waves, sound production and radiation, electro-acoustic devices, sound control. Lecture and laboratory. Prerequisites: 225 and 255.

382—Lasers and Their Applications (3). (same as Mechanical and Aerospace Engineering 382, Nuclear Engineering 382). An introductory course in lasers. The course treats the subject from both a conceptual viewpoint and from the application of Maxwell's equations, to develop the optical theory for lasers. The course includes approximately 10 class- room hours of laboratory work with lasers. Prerequisites: Physics 176 and Math 304.

388—Design and Simulation of VLSI Circuits (4). Design of CMOS integrated circuits with emphasis on analog applications. Device models are developed for circuit simulation. Lecture and laboratory. Prerequisite: 334.

398—Senior Capstone Design I (3). (same as Computer Engineering and Computer Science 398). Group design projects. Design methodology, project management, development of specifications, examination of alternatives, preparation of proposal. Oral and written reports. Not for graduate credit. Prerequisites: EE 296, senior standing, concurrent enrollment in a design designated 300 level course.

399—Senior Capstone Design II (2). (same as Computer Engineering and Computer Science 399). Completion of ECE 398 design project. Design prototyping, testing, evaluation and preparation of documentation. Lectures on ethics, professionalism, safety, economic consideration. Oral and written reports. Not for graduate credit. Prerequisite: 398.

400—Problems (2-5). Supervised investigation of an electrical engineering problem for an MS project. Study culminates in a project report. Graded on a S/U basis only. Adviser's consent required.

401—Advanced Topics in Electrical Engineering (3).

402—Power Electronics II (3). Circuit concepts and analysis techniques for transistor switching regulators, thyristor choppers, transistor inverters, self-commutated thyristor investors and cycloconverters. Prerequisite: 336.

403—Power Simiconductor Devices (3). A study of the semiconductor devices used in switch-mode power converter circuits. Course surveys the field and discusses selected devices in depth. Prerequisites: ECE 235 or equivalent ECE 332 or 333 or equivalent.

404—Supervised Study in Electrical Engineering (1-3). Supervised individual study at the graduate level to be completed within the course of one semester in the form of a brief report. Prerequisite: instructor's consent.

407—Advanced Digital Signal Processing (3). Topics in digital signal analysis and filtering. Including hardware implementation, speech synthesis and recognition, multi-dimensional transforms, random-signal concepts, design methods and computer aids to analysis and design. Prerequisite: 307.

408—State Variable Methods in Automatic Control (3). (same as Chemical Engineering 408, Mechanical and Aerospace Engineering 408, Nuclear Engineering 408).

410—Seminar (1). Reviews of recent investigations, projects of major importance. Prerequisite: graduate standing.

412—Power Electronic Drives (3). Advanced study of DC and AC motor drives controlled by power electronic methods, including phase controlled rectifier, DC chopper, cycloconverter, variable frequency inverters. Prerequisites: 402 or instructor's consent. Recommended: 408, 411.

413—Introduction to Fourier Optics (3). Diffraction, lenses, and coherence treated in terms of systems and transform concepts with applications; two- and three-dimensional signals, Fourier and Hankel transforms, random signals, diffraction, and holography. Prerequisites: 372 or instructor's consent.

428—Digital Hardware Systems Design (3). (same as Computer Engineering and Computer Science 428). Characteristics and parameters of various hardware subsystems including main memory, auxiliary memory, arithmetic units, card equipment, etc., and principles of organization into efficient system. Prerequisite: 328.

430—Power System Compensation and Control I (3). Current research in selected aspects of electrical power systems, including reactive power compensation, stability, and control; power system simulation using commercial-grade packages. Prerequisite: 361 or equivalent.

432—Numerical Analysis of Semiconductor Devices (3). Basic equations of semiconductor device analysis, associated boundary conditions, and physical models; discretization schemes and numerical solution methods; application to one and two dimensional bipolar and field effect device structures in thermal equilibrium and under DC steady State and transient operating conditions. Prerequisites: 332 or 333 or their equivalent.

440—Advanced Photonics (3). Concetrated study of optical system design, including integrated optics, semiconductor lasers, quantum wells, optical materials, and electro-optical effects used in modern optical systems. Prerequisite: EE 340.

441—Advanced Electromagnetics (3). Advanced theoretical electromagnetic theory. Investigation of summation problems with general boundary conditions, time varying fields, and time harmonic currents. Basic applications and relationships in classical and relativistic physics. Prerequisite: EE 225.

442—Advanced Integrated Circuits (3). Fundamentals of advanced integrated circuit design; diffusion, ion implanta-

tion and epitaxy; MOS and bipolar techniques; survey of current LSI design, fabrication and testing.

443—Solid State Theory I (3). Principles of quantum and wave mechanics as applied to solid state; Boltzman and Fermi statistics; energy band theory of crystals; electrons, holes in semiconductors. Current flow in P-N junctions, semiconductor devices. Prerequisite: graduate standing.

444—Solid State Theory II (3). Fundamentals of crystallography; application of X-ray analysis to the study of crystallinity. Quantum mechanical solution for the wave function of an electron in a solid; concepts of reciprocal space. Prerequisites: 443 or Physics 415.

447—Magnetogasdynamics (3). Flow of electrically conducting fluids in the presence of applied electromagnetic field.

450—Superconductivity and its Applications (3). (same as Mechanical & Aerospace Engineering 450 and Nuclear Engineering 450). Phenomenology and theory of superconductivity, cryogenic practice, metallurgy of superconducting elements, alloys and compounds. Present and prospective applications.

460—Nueral Networks for Learning Control (3). Neurocomputing techniques and structures for modeling, learning control, control stabilization, and optimization of performance over time. Prerequisites: at least on 300- or 400- level control course or instructor's consent.

466—Multivariable Control System Design (3). This course will cover techniques in multivariable control system design and analysis, including LOG H-2 design, H-oo design, LTR, robust performance, and selected adaptive and learning control techniques for nonlinear control. Prerequisites: EE 408 or acceptable equivalent.

467—Optimal Control Theory (3). Analysis and design of dynamic systems using optimal control theory: parameter optimization, dynamic optimization, computational methods, differential games. Prerequisite: 408.

472—Advanced Communications Systems (3). Advanced topics on the performance of communication systems, including probability and random processes, signal space representation, optimal receivers, matched filtering, coherent detection of signals in noise, probability of error, and bit error rate. Prerequisites: EE 307 and EE 372.

474—Artificial Intelligence (3). Concepts, theories, and models pertaining to neural nets, pattern recognition, learning systems, and programmed problem solving. Prerequisites: graduate standing and instructor's consent.

477—Digital Signal Processing in Telecommunications (3). Applications of digital signal processing in telecommunication systems; oversampling and quantizations, Delta-Sigma modulation, linear predictive speech coding, adaptive filtering, echo canceller, adaptive receivers and equalizers for wireless communication, digital cellular, CDMA. Prerequisites: EE 307 and EE 372.

478—Coding Theory and Applications (3). Basics of information theory and source coding, error control channel coding, linear codes, block codes, convolutional codes, trellis coding, Veterbi decoding, and applications. Prerequisite: EE 372.

480—High Frequency Transmission and Radiation (3). Skin effect; theory of transmission lines, wave guides, resonators.

481—Antennas (3). Point and aperture sources; simple antennas; antenna array; data-processing antennas; and other broadband and directive antennas.

482—Probability & Stochastic Processing for Engineers (3). Introduction to probability, multidimensional complex (phaser) random variables and stochastic processes in electrical engineering. Prerequisites: 307, 372, or 413.

490—Research (1-99). Independent investigation in a field of electrical engineering to be presented as thesis or dissertation. Graded on a S/U basis only. Prerequisite: adviser's consent.

English

College of Arts and Science
107 Tate Hall (573) 882-6421

FACULTY

Howard H. Hinkel, chair, associate professor, PhD, Tulane University.
Charles H. Hinnant, director of graduate studies, professor, PhD, Columbia University.
Donald Anderson, professor emeritus, PhD, Duke University.
Leon T. Dickinson, professor emeritus, PhD, University of Chicago.
James V. Holleran, professor emeritus, PhD, Louisiana State University.
William V. Holtz, professor emeritus, PhD, University of Michigan.
Winifred B. Horner, professor emerita, PhD, University of Michigan.
William M. Jones, professor emeritus, PhD, Northwestern University.
Mary M. Lago, professor emerita, PhD, University of Missouri-Columbia.
Donald M. Lance, professor emeritus, PhD, University of Texas.
William M. Peden, professor emeritus, PhD, University of Virginia.
Gladys Swan, associate professor emerita, MA, Claremont Graduate School.
Robert M. Bender, professor, PhD, University of Michigan.
Martin J. Camargo, professor, PhD, University of Illinois.
Thomas D. Cooke, professor, PhD, University of Pittsburgh.
J. Donald Crowley, professor, PhD, The Ohio State University.
Albert J. Devlin, professor, PhD, University of Kansas.
John M. Foley, professor, PhD, University of Massachusetts.
Howard W. Fulweiler, professor, PhD, University of North Carolina.
Richard A. Hocks, professor, PhD, University of North Carolina.
Elaine J. Lawless, professor, PhD, Indiana University.
Timothy Materer, professor, PhD, Stanford University.
Lynne McMahon, professor, PhD, University of Utah.
Speer Morgan, professor, PhD, Stanford University.
Catherine N. Parke, professor, PhD, Stanford University.
M. Gilbert Porter, professor, PhD, University of Oregon.
Thomas V. Quirk, professor, PhD, University of New Mexico.
Ellie Ragland, professor, PhD, University of Michigan.
John R. Roberts, professor, PhD, University of Illinois.
Sherod Santos, professor, PhD, University of Utah.
C. Gilbert Youmans, professor, PhD, University of Wisconsin.
Prahlad Folly, associate professor, PhD, University of California-Los Angeles.
Clenora Hudson-Weems, associate professor, PhD, University of Iowa.
Douglas G. Hunt, associate professor, BA, Oxford University.
Geta LeSeur, associate professor, PhD, Indiana University.
Trudy Lewis, associate professor, PhD, University of Illinois-Chicago.
Patricia Okker, associate professor, PhD, University of Illinois.
Thomas Stroik, associate professor, PhD, University of Wisconsin-Madison.
Prahlad Folly, associate professor, PhD, University of California-Los Angeles.
James Comas, assistant professor, PhD, University of Southern California.
Noah Heringman, assistant professor, PhD, Harvard University.
William Kerwin, assistant professor, PhD, University of North Carolina-Chapel Hill.
Maureen Konkle, assistant professor, PhD, University of Minnesota.
Karen Piper, assistant professor, PhD, University of Oregon.
David T. Read, assistant professor, PhD, University of Chicago.
Patricia Roberts-Miller, assistant professor, PhD, University of California-Berkeley.
Martha Townsend, assistant professor, PhD, Arizona State University.
Nancy West, assistant professor, PhD, University of North Carolina-Chapel Hill.
Jeffry Williams, assistant professor, PhD, SUNY-Stony Brook.

DEGREES: MA and PhD in English

Lecture courses, seminars, and directed research are available in British and American language and literature, creative writing, folklore and oral tradition, critical theory, rhetoric and composition. Students admitted to the graduate program usually receive a fellowship or teaching assistantship. Outstanding applicants will also be eligible to compete for a variety of College and University fellowships. Students will also have the opportunity to assist faculty in editing *The Missouri Review*, a nationally recognized journal of fiction, poetry and essays; *Oral Tradition,* the only journal involved in the comparative study of oral traditions; *The Missouri Folklore Journal,* an annual publication devoted to the varied folk traditions of Missouri, and *The Minnesota Review,* a journal devoted to the discussion of contemporary issues and theoretical questions. The deadline for applications to both the MA and PhD programs is **January 15.** Announcements of awards are made in **early April.** ***For additional information concerning degree programs or for fellowship and assistantship application forms, please write or call the Director of Graduate Studies in English, 107 Tate Hall, Columbia, MO 65211, enggrad@showme.missouri.edu, (573) 882-6421, Fax: [573] 882=5785. The departmental website is http://www.missouri.edu/~engwww.***

MASTER'S DEGREE: An MA candidate should have majored in English as an undergraduate, with at least 18 hours in upper-division courses in literature or linguistics. Students with other undergraduate majors may be admitted provided their background in the study of English language and literature is suitable and provided they agree to complete an appropriate course of preliminary study.

The candidate should have an overall undergraduate average of at least a B (GPA of 3.0, A=4.0), with a higher average in courses in the major (GPA of 3.3). Applicants must submit Graduate School and departmental application forms, official transcripts of all undergraduate

work, three letters of recommendation, and a copy of scores from the general area of the Graduate Record Exam (GRE). The examination must have been taken within five years of the candidate's application to the MA program. The subject area is recommended but not required. Applicants should also submit samples of their writing: e.g., undergraduate essays, fiction, and/or poetry. Promising students who do not meet one or more of these criteria may at the discretion of the director of graduate studies be encouraged to enroll as postbaccalaureate special students.

The MA is a four-semester (two year) program with 30 hours of course work (including a minimum of 15 hours at the 400-level in English). A student seeking an MA in English also elects one of five emphasis areas: Literature, Creative Writing, Rhetoric and Composition, Folklore and Oral Tradition, or Critical Theory.

A student may elect to take a Comprehensive Exam either at the end of the second year or during the summer following the second year, or write an MA thesis (6 hours of 490). Students who elect to take the MA Comps will be assigned a three-member committee to whom they will be asked to present a reading list and seven questions for approval; three of these questions will appear on the four-hour exam. Students who choose the MA thesis should discuss possible thesis topics during the first year with the faculty members who will constitute their MA thesis committee. The MA thesis is strongly encouraged for students who are considering pursuing advanced doctoral work.

The department also offers a three semester (1-1/2 year) MA/PhD program with 30 hours of course work in English (including a minimum of 15 hours at 400-level). In addition to literary study, students in the MA/PhD program may also elect from among the following emphasis areas: Literature, Critical Theory, Folklore and Oral Tradition, and Rhetoric and Composition.

There is no foreign language requirement for the MA or MA/PhD degree in English at MU, but students who wish to go on to the PhD are urged to pass a reading comprehension examination in at least one foreign language during their two years of graduate work.

DOCTORAL DEGREE: The requirements for admission to the PhD program are much more demanding than the requirements for admission to the MA program. A student wishing to continue beyond the master's degree at MU must apply formally and will be considered in competition with applicants who have taken the MA degree or its equivalent elsewhere. To apply, candidates must submit official transcripts of all undergraduate and graduate work, three letters of recommendation, a supplementary information sheet, two samples of critical or creative writing, and scores from the general area of the Graduate Record Exam (the subject area is recommended but not required). International applicants must send a copy of their TOEFL scores, which normally should be at least 550 for the MA and 600 for the PhD. The examination must have been taken within five years of the candidate's application to the PhD program.

Before the end of the first semester, each doctoral student must meet with the Director of Graduate Studies in order to select a doctoral advisory committee. Students meet with this committee in either the first semester or early part of the second semester to plan coursework and define tentatively the major and minor fields of study. This meeting is also designed to satisfy the graduate school requirement for a PhD qualifying examination.

The PhD is a five-year program and the candidate will normally take 30 hours of course work beyond the MA, all of which must be elected at the 400-level, with the exception of the required English language course and optional courses in other departments. Students are encouraged to take at least 6 hours of course work in Doctoral Seminars (English 499). Candidates with insufficient background in English or in a particular emphasis area may be required to take additional hours upon the recommendation of the advisory committee. A student may take one English 400 Problems course for 3 hours of credit, with the prior consent of the graduate studies committee. A minimum of 18 hours of course work (excluding research hours) must be taken in residence at the Columbia campus in order for the candidate to be eligible to receive the PhD from the University.

A student may satisfy the foreign language requirement for the PhD in English by demonstrating either:

- High proficiency in one foreign language or
- Medium proficiency in two foreign languages.

To demonstrate high proficiency the student must pass, with a grade of B or better, two upperclass courses in the literature of the language chosen. These courses may not be in translation and must be either at the 200 level or above at the University of Missouri-Columbia, or the equivalent elsewhere. To demonstrate medium proficiency the student must pass, with a grade of B or better, either the three-semester introductory sequence or one course at or beyond the third semester level in the language chosen. Alternatively, medium proficiency may be demonstrated by passing the ETS examination with a minimum score of 550 for French, 550 for Spanish, or 550 for German. The courses must have been completed or the examinations taken within four years of the candidate's enrollment in the PhD program. French, German, or Latin will be accepted automatically as fulfilling the requirement. Another language—with equivalent demonstration of proficiency—may be substituted with the consent of the student's advisory committee.

In addition, all PhD candidates will have had or will be required to take 1) a course in either the structure of the English language (English 340, English 440, or an equivalent course elsewhere) or in the historical aspects of the English language (English 341, English 315, or an equivalent course elsewhere); 2) a course in writing for publication (English 498 or its equivalent elsewhere); and 3) a course in the history or theory of criticism (English 437 or its equivalent elsewhere).

After all course work, the foreign language requirement, and the residency requirement have been completed, the student will take a PhD comprehensive examination, composed of an eight-hour written exam covering the student's special field, 2) a four-hour written exam covering the student's second field in English, and 3) a two-hour oral exam over both fields.

The capstone of the PhD program, the doctoral dissertation, must be proceeded by a prospectus in which the candidate describes the topic in a proposal that explains the nature of the study to be undertaken, the present position of the scholarship on the subject, and the nature of the expected contribution to knowledge. The doctoral dissertation is written under the direction of the candidate's adviser, a member of the Doctoral Faculty at MU. The final examination is oral and is both a defense of the dissertation and an examination on the dissertation field.

The PhD candidate may elect a Creative Writing Degree program in which she or he will take 9-12 hours of 400 level Creative Writing Workshops as part of the PhD course work and write a Creative Dissertation: either a novel or a book-length collection of poems or stories.

COURSES

104—African-American Literature (3). (same as Black Studies 104). Surveys writing by African- American authors from early 19th century to the present using a socio-historical approach to show the development of a black literary tradition. Prerequisite: 20. cor.

204—Survey of African-American Literature (3). (same as Black Studies 204) A genre-focused survey of African-American literature from the Harlem Renaissance to the present. Courses may focus on the novel, the essay and other non-fiction forms, poetry, or drama. Prerequisite: 20

205—Introduction to Literary Study (3). Instruction in the fundamentals of writing about literature for prospective English majors; emphasizes the basic vocabularies and processes of literary research, interpretation, and criticism. Course covers two or more literary theories and two or more literary genres. Prerequisite: 20 and sophomore standing.

206—Special Themes in Literature (3-6). Topics (e.g., Postmodernism, Representations of Nature) announced at time of registration. Prerequisites: 20 or equivalent and sophomore standing. May be repeated to six hours with consent of department.

208—Survey of Women Writers (3). (same as Women Studies 208). A study of writing by women from the Middle Ages to the present. Prerequisite: sophomore standing.

211—Intermediate Playwriting (3). (same as Theatre 211). Intermediate study of the writing process as applied to theatre, leading to the creation of a full-length play to be considered for production. Prerequisite: 111.

215—Survey of British Literature: Beginnings to 1784 (3). Historical survey from beginnings of British literature through the age of Johnson, with readings representing significant writers, works and currents of thought. Prerequisite: 20 or equivalent.

216—Survey of British Literature: Romanticism to the Present (3). Historical survey of British literature from the Romantic period to the present, emphasizing important writers and significant intellectual and cultural movements. Prerequisite: 20.

225—Survey of American Literature 1607-1890 (3). A survey of major writers and movements in American literature from colonialism to realism. Prerequisite: 20 or equivalent.

226—Survey of American Literature 1890-Present (3). A survey of major writers and movements in American literature from realism to postmodernism. Prerequisite: 20 or equivalent.

250—Independent Research in English (1-3). Development of a carefully considered independent research project under close supervision of a faculty member. Open to undergraduate students only. Prerequisites: 205 and departmental consent.

261—Advanced Composition (3). An intensive writing workshop in which student essays and related texts receive close reading and analysis. Focus (e.g. The Essay, The Research Paper) announced at time of registration. Prerequisite: 120 or instructor's consent.

280—Internship (1-3). Students work in an agency or institution using their English related skills for one to three credit hours. Prerequisite: junior standing, department's consent. Graded on an S/U basis only.

285—American Folklore (3). (same as Anthropology 284). Focus on regional and ethnic folklore; emphasis on analysis of folklore in context. Requirements include book reports and two analytical papers based on student field research.

290—Honors Senior Essay (3). Independent project for completion of honors work in English. Open to departmental honors candidates only.

296—Honors Seminar: Critical Approaches to Literature (3). Studies major critics, with emphasis on the application of criticism to the study of literature.

297—Honors Seminar: Historical Approach to Literature (3). Introduces the historical approach to the study of literature and the development of major traditions of English literature, with readings selected from several periods.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May repeat to six hours.

302—The Writing of Fiction (3). An intensive writing workshop in which student stories and related literary texts receive close reading and analysis. Prerequisite: English 150 or equivalent.

304—Major African-American Writers (3). (Same as Black Studies 304.) An intensive study of selected African-American writers. May repeat to six hours with department's consent.

305—Internship in Publishing (3). Offers practical experience working with a literary or scholarly publication edited or sponsored by faculty members. Graduate students in English must take the course two semesters in order to count three hours toward the completion of their program. Prerequisite: instructor's consent.

308—Major Women Writers (3). (Same as Women Studies 308.) Study of a limited number (1-3) of significant writers to be read intensively using contemporary feminist critical theory. May repeat to six hours with department's consent.

308A—Major African-American Women Writers (3). (same as Women Studies 308 and Black Studies 308A). Study of a limited number (1-3) of significant African-American writers to be read intensively using contemporary feminist critical theory. Prerequisite: two courses in British or American literature. Repeatable with department's consent. Maximum of six hours for 308 and 308A.

311—Advanced Playwriting: Problems (3). (same as Theatre 311). Advanced study of the writing process as applied to theatre, including theory and practice. Special playwriting problems and techniques. Prerequisite: 211.

312—Advanced Playwriting (3). (same as Theatre 312). Advanced study of the writing process as applied to theatre, leading to the creation of a full-length play to be considered for production. Prerequisite: 311, Beginning Playwriting.

313—The Writing of Poetry (3). Poetry regarded as a mode of understanding. Poetic values related to other values. Practical consideration of verse techniques. Prerequisite: English 170 or equivalent.

315—Introduction to Old English (3). (same as Linguistics 316). A beginning study of the Old English or Anglo-Saxon language in its cultural context, with emphasis on gaining a reading knowledge. Prerequisite: junior standing.

317—Medieval Literature (3). Representative works from the Anglo-Saxon and Middle-English periods. May repeat to six hours with department's consent. Prerequisite: junior standing.

321—Renaissance and 17th-Century English Literature (3). Topics (e.g., The Metaphysical Poets, Themes in Shakespeare) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

324—Restoration and 18th-Century English Literature (3). Topics (e.g., Restoration Drama, Johnson and his Circle) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

327—19th-Century English Literature (3). Topics (e.g., Victorian Poetry, Non-Fiction Prose) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

328—20th-Century British Literature (3). Topics (e.g. Contemporary British Poets, The Post-War Novel) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

329—Early American Literature (3). Topics (e.g., Narratives of Discovery and Exploration, The Puritan Heritage) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

330—19th-Century American Literature (3). Topics (e.g., American Romanticism, Regionalism) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

332—20th-Century American Literature (3). Topics (e.g., American Poetry since T. S. Eliot, The Short Story) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

334—Ethnic Literature (3). Explores in depth the literary traditions of one of America's minority ethnic cultures: Native American, African-American, Hispanic American, Asian American. May repeat to six hours with department's consent. Prerequisite: junior standing.

337—World Literatures (3). Study of important works and writers from Asia, Africa, Europe, Latin America or the mid-East. Topics (e.g., Survey of World Literature, The Bible) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

338—Studies in Critical Theory (3). Focuses on questions raised by various critical theories, includes practice writing criticism that applies the theories to particular works. May repeat to six hours with department's consent. Prerequisite: junior standing.

339—History of Criticism (3). Surveys modern and contemporary theories of literary criticism: historical, archetypal, generic, formalist, phenomenological and interdisciplinary. Emphasizes key writers in each field. Prerequisite: junior standing.

340—Structure of American English (3). (same as Linguistics 340). Introduction to English linguistics. Study of the grammar and pronunciation of contemporary English, with the major focus on syntax. Prerequisite: junior standing.

341—History of the English Language (3). (same as Linguistics 341). Historical changes in the grammar and pronunciation of the English language from Old English to the present. Introduction to Indo-European origins of English. Prerequisite: junior standing.

342—Regional and Social Dialects of American English (3). (same as Linguistics 342). The study of regional and social variation in pronunciation, vocabulary, and syntax of American English. Prerequisite: 340, 341 or equivalent.

343—Principles of Teaching English as a Second Language (3). (same as Linguistics 343.) Linguistic and pedagogical principles of teaching English to speakers of other languages. Prerequisite: 340, 341 or equivalent.

344—Topics in Linguistics (3-6). (same as Linguistics 344). Descriptive and historical studies in English Linguistics. Repeatable to six hours with department consent. Prerequisite: junior standing.

346—Themes in Literature by Women (3). (same as Women Studies 315). Examines works by a number of women writers with particular attention to their socio-political context. May repeat to six hours with department's consent. Prerequisite: junior standing.

350—Special Readings (1-99). Individual work with conferences adjusted to needs of student. Prerequisites: 300-level course in area of proposed work and written consent of instructor. Restricted to senior English majors in their final semester.

354—Literature of the Black Diaspora (3). (same as Black Studies 354). An upper division course which explores other literatures written in English by and about people of African descent from South Africa, West Africa, the Caribbean, Central America, and Canada. Prerequisite: sophomore standing or above with backgrounds in Black history and/or literature.

360—Historical Survey of Rhetoric (3). A survey of major works of rhetoric from Plato to the present day, with special attention to those works influencing English language rhetorics and theories of rhetoric. Prerequisites: 20 and sophomore standing.

361—Writing Nonfiction Prose (3). An advanced writing workshop in nonfiction prose. Topics (The Personal Narrative, Nature Writing) announced at time of registration. May repeat to six hours with departmental consent. Prerequisite: 120 or instructor's consent.

370—Genres (3). Advanced survey of major movements and writers. Topics (e.g., American Poetry, The Development of the British Novel) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

371—Comparative Approaches to Literature (3). Study of works separated by the places or eras of their composition, but united by themes or traditions. Topics (e.g., Poets of African Diaspora, Literatures of Exile) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

374—Major Authors (3). Intensive study of the work of a single writer (e.g., Milton) or set of writers (e.g., Whitman and Dickinson). Topic announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

385—Special Themes in Folklore (3). (same as Anthropology 384). Intensive study in a selected area of folklore: folk narrative, folk song, myth, proverb, etc., folklore of a particular group. May be repeated for a maximum of six hours with department's consent.

385A—Themes in African-American Folklore (3). (same as Anthropology 384A and Black Studies 385A). Intensive study in a selected area of African-American folklore: folk narrative, folk song, myth, proverb, etc. folklore and literature; or the folklore of a particular group. 385 and 385A may be repeated for a maximum of six hours with instructor's consent. Prerequisite: junior standing.

386—Women's Folklore and Feminist Theory (3). (same as Women Studies 386). Examines folklore and artistic expression of women in relation to feminist theory and in multicultural contexts. Includes verbal genres (narrative/song) as well as material genres (quilting/arts). Prerequisite: junior standing or instructor's consent.

387—Oral Tradition (3). Study of verbal art from living oral traditions (e.g., Native American and African American) and important literary works with roots in oral tradition (e.g., the Bible, the Iliad the Odyssey, and Beowulf). Prerequisite: junior standing and instructor's consent.

389—Modern Literature (3). A study of selected twentieth-century literature within the intellectual and cultural contexts of the modern era.

398—Capstone Experience (3). For students in their last semester, this course focuses on a major project and the processes of selection, research, and writing leading to its completion. Includes a professional component (resume, cover letter). Prerequisite: English major with senior standing.

400—Problems (1-99). Individual work not leading to preparation of dissertation. Prerequisite: departmental approval.
401—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester.
402—Advanced Writing of Fiction (3). Advanced fiction writing designed primarily for graduate students, with the intention of producing work of professional quality. May repeat to twelve hours with consent of instructor. Prerequisite: instructor's consent and 302.
413—Advanced Writing of Poetry (3). Advanced poetry writing designed primarily for graduate students with the intention of producing work of professional quality. May repeat to twelve hours with consent of instructor. Prerequisite: instructor's consent and 313.
415—Studies in Old English Literature (3). Topics in Old English or Anglo-Saxon literature, such as Beowulf, the Exeter Book poems, or the genres of elegy, Biblical narrative, or wisdom poetry. May repeat to twelve hours with department's approval. Prerequisite: 315 or equivalent.
417—Studies in Middle English Literature (3). Topics (e.g., Medieval Drama, Chaucer) announced at time of registration. May repeat to twelve hours with department's approval.
421—Studies in Renaissance British Literature (3). Topics (e.g., Tudor and Stuart Drama, Shakespearean Tragedy) announced at time of registration. May repeat to twelve hours with department's approval.
422—Studies in 17th-Century British Literature (3). Topics (e.g., The Metaphysical Poets, Restoration Drama) announced at time of registration. May repeat to twelve hours with department's approval.
423—Studies in 18th-Century British Literature (3). Topics (e.g., The 18th-Century Novel, Historical and Biographical Prose) announced at time of registration. May repeat to twelve hours with department's approval.
427—Studies in 19th-Century British Literature (3). Topics (e.g., The Later Romantics, Victorian Poetry) announced at time of registration. May repeat to twelve hours with department's approval.
428—Studies in 20th-Century British Literature (3). Topics (e.g., Chief Contemporary Poets, Modernism and the Novel) announced at time of registration. May repeat to twelve hours with department's approval.
429—Studies in Early American Literature (3). Topics (e.g., Religious and Philosophical Writings, The Revolutionary Period) announced at time of registration. May repeat to twelve hours with department's approval.
432—Studies in 19th Century American Literature (3). Topics (e.g., The Transcendentalists, American Realism) announced at time of registration. May repeat to twelve hours with department's consent.
434—Studies in 20th-Century American Literature (3). Topics (e.g., The African-American Novel, Chief Contemporary Poets) announced at time of registration. May repeat to twelve hours with department's consent.
437—Studies in Criticism and Theory (3). Principles and practices of selected critics. May repeat to twelve hours with department's consent.
440—Studies in the English Language (3). (same as Linguistics 440). Descriptive and historical studies of the English language. Topics (e.g., The Germanic Origins, Modern Syntactic Analysis) announced at time of registration. May repeat to twelve hours with department's approval.
460—Theory and Practice of Composition (3). Current and historical theories of rhetoric and composition as applied to the teaching of college composition. Prerequisite: department's consent.
462—Studies in Rhetoric and Composition (3). Topics (e.g., The Institutionalization of Rhetoric, Writing Across the Curriculum) announced at time of registration. May repeat to twelve hours with department's approval.
470—Forms (3). Topics (e.g., The Epic, The Epistolary Novel) announced at time of registration. May repeat to twelve hours with department's approval.
485—Studies in Folklore (3). (same as Anthropology 484 and Religious Studies 475). Focus on the roots of folklore scholarship and methodology and their evolution in modern approaches to the study of oral, traditional verbal genres and their performance in natural folk groups. Graduate standing or permission of instructor. May repeat to twelve hours with department's consent.
487—Studies in Oral Tradition (3). Theoretical and interpretive perspectives on works of verbal art that have roots in oral tradition. Emphasis on the variety of approaches employed (performance theory oral theory, ethnopoetics, ethnography of speaking, comparative structural studies, etc.) May repeat to twelve hours with department's consent.
490—Research (1-99). Leads to preparation of dissertation. Graded on S/U basis only.
498—Writing for Publication (3). Provides guidance in the process of revising and submitting an original essay for publication. Prerequisite: consent of Director of Graduate Studies.
499—Seminars for Doctoral Candidates (3). A. Seminar in the English Language. B. Seminar in Medieval Literature. C. Seminar in Renaissance Literature. D. Seminar in 17th-Century Literature. E. Seminar in 18th-Century Literature. F. Seminar in Romantic Literature. G. Seminar in Victorian Literature. H. Seminar in American Literature. I. Seminar in 20th-Century Literature.

Entomology

College of Agriculture, Foods and Natural Resources
1-87 Agriculture Building (573) 882-7894

FACULTY

Robert D. Hall, interim coordinator, professor, PhD, Virginia Polytechnic Institute, JD, University of Missouri.
Elaine A. Backus, director of graduate studies, associate professor, PhD, University of California-Davis.
Bruce A. Barrett, director of admissions, associate professor, PhD, Washington State University.
G. Michael Chippendale, professor, PhD, University of Wisconsin.
Marc J. Linit, professor, PhD, University of Arkansas.
Thomas L. Payne, dean of the College of Agriculture, Food and Natural Resources, professor, PhD, University of California-Riverside.
Carlo M. Ignoffo, adjunct professor, PhD, University of Minnesota.
Wayne C. Bailey, associate professor, PhD, Iowa State University.
Robert W. Sites, associate professor, PhD, Washington State University.
Thomas A. Coudron, adjunct associate professor, PhD, North Dakota State University.
Arthur H. McIntosh, adjunct associate professor, ScD, Harvard University.
Bruce E. Hibbard, adjunct assistant professor, PhD, Colorado State University.

DEGREES: MS and PhD in entomology

A student can select training from a range of courses and research programs to fit the needs for a career in any of the many areas of professional entomology, including research, teaching, industry and extension work. Current research programs in the department emphasize the following areas: behavior, biological and chemical control; ecology; forest entomology; host-plant relations; insecticidal residues; medical and veterinary entomology; morphology; pest management; physiology; biochemistry and systematics.

The department has research laboratories as well as preparation rooms, classrooms and teaching laboratory facilities. The research laboratories are equipped with a range of instruments and environmental growth chambers for advanced study. The department also has access to the experimental station chemical and spectroscopic laboratories.

The Enns Entomology Museum houses nearly 6 million specimens, many of which are aquatic, and is the largest university insect collection in the world. Research opportunities offered through the museum span a broad range of projects blending systematics and ecology of terrestrial and aquatic insects.

Excellent library facilities on campus include Ellis Library and up-to-date medical and veterinary branch libraries. The computing center and nuclear reactor also offer facilities for more specialized research.

Field research scientists are served by greenhouses on campus and a 40-acre entomology farm near Columbia. Eight other experiment station farms provide many opportunities for studying the various insect problems that exist throughout Missouri. For those interested in ecology, the state offers a large acreage of natural wildlife reserves, including Tucker Prairie and the Thomas A. Baskett Wildlife Research and Education Area, both within 25 miles of Columbia.

The department conducts cooperative research projects with the USDA Biological Control of Insects Research Laboratory, the USDA Plant Genetics Unit, and the Midwest Science Center, all in Columbia.

Graduate research assistantships at competitive rates are available to aid qualified students in their master's and doctoral programs in entomology.

For further information, write the Director of Admissions in Entomology or a specific faculty member, 1-87 Agriculture Building, Columbia, Mo. 65211; (573) 882-7894 (phone); 882=1469 (fax); e-mail: forent.insecta.missouri. edu.

MASTER'S DEGREE: A screening committee determines acceptance for advisement in the department. The applicant must submit official transcripts from all colleges attended, three letters of recommendation from professors, a letter of intent and GRE scores. The degree program is arranged by the student and the adviser. Although there are some departmental requirements, the program is flexible to meet individual needs. To fulfill the degree requirements a candidate must meet all Graduate School requirements, submit a thesis and pass a final oral examination.

DOCTORAL DEGREE: The policy for acceptance for advisement as an MS candidate holds for acceptance for advisement as a PhD candidate. The flexible PhD program is arranged by the student's doctoral program committee. Special emphasis is placed on developing the student's research aptitude. A qualifying exami-

nation is required. The language requirement can be met by appropriate credit in one language or in one collateral field. A written and oral comprehensive examination, a dissertation and a final oral examination are required.

COURSES
ENTOMOLOGY

201—Topics in Entomology (1-99). Instruction in select subject matter areas in the field of entomology.

208—Introductory Entomology (2-3). (same as Biological Sciences 208). Holistic biology of insects, including anatomy, physiology, behavior ecology, and management. Prerequisites: Biological Sciences 10, 11, 12, or equivalent.

209—Insect Diversity (1). (same as Biological Sciences 209). Laboratory emphasizing external insect anatomy, classification, and identification to the family level. Insect collection is required. Prerequisite: Concurrent enrollment or previous satisfactory completion of Entomology/Biology 208.

209B—Forest Insects (1). (same as Forestry 209C). Identification, life histories, population dynamics, and management of insects in forest environments. Prerequisite: concurrent enrollment or previous satisfactory completion of 209.

300—Problems (1-99). By arrangement, students may take special problems in different entomology fields as preparation for research. Prerequisites: 10 hours Entomology and Biological Sciences.

301—Topics in Entomology (1-99). Instruction in select subject matter areas in the field of entomology. Prerequisites: 208 and 209A.

302—Comparative Morphology of Insects (4). Comparative study of external and internal structures and systems of insects, with emphasis on structure-function relationships. Prerequisites: 208 & 209A. f, even years.

304—Systematic Entomology (5). (same as Biological Sciences 304). Taxonomy of insects: emphasizes biology and classification of orders and major families. Insect collection required. Prerequisites: 208 or 209A or 10 hours biological sciences f. odd years.

306—Aquatic Entomology (3). Identification, life histories, ecology of aquatic arthropods; emphasizes fresh-water insects. For students of wildlife, fisheries management, aquatic biology, advanced entomology. Prerequisites: 208 and 209A and Biological Sciences 11 and 304 or equivalent. w, odd years

312—Insect Pest Management for Plant Protection (3). Identification and importance of insect pests of crops, detection techniques, economic injury levels, and recent development in control techniques of importance to insect management decisions. Prerequisites: 208 and 209A. w, even years.

316—Principles of Insect Physiology (4). (same as Biological Sciences 316). (3 hrs. lecture, 2 hrs. lab) Major concepts of insect physiology emphasizing functions of organ-systems sensory physiology hormones in development, nutrition. Prerequisites: 208, 209A and 302 or equivalent. f, odd years.

321—Professionalism and Ethics (3). Current issues affecting conduct of science in Agriculture, including research integrity, publication, research funding, professionalism and current ethical problems. Upperclass/ graduate standing. f.

322—Biological Control of Insects (3). Presents principles of biological control of insects, emphasizing parasites, predators, diseases of insects, characteristics of natural insect populations. Prerequisites: 319 and 304 or instructor's consent. f, odd years.

350—Special Readings (1-99). Publications in a chosen field will be studied to acquaint students with technical literature.

361—Insects in Relation to Plant Diseases (3). (same as Plant Pathology 361). Ecology, behavior, physiology and molecular biology of insect transmission of plant pathogens. Lectures and discussions. Prerequisites: Plant Pathology 305 or 405 and Entomology 208, or instructor's consent. w, odd.

370—Advances in Insect Pest Management (3). (same as Pest Management 370). Presents current concepts, techniques, and applications for developing and implementing pest management systems. Prerequisites: 312, Pest Management 180, Biological Sciences 362 or equivalent. w, odd years.

400—Problems (1-99). Advanced individual studies; includes minor research problem.

401—Topics in Entomology (1-99). Instruction in specific subject matter areas in the field of entomology. Prerequisites: graduate standing & instructor's consent.

405—Taxonomy of Immature Insects (3). Identification of orders, families, genera, species of insects in immature stages. Surveys pertinent literature. Prerequisite: 304 or equivalent. f, even years.

410—Seminar (1-99). Reviews of current literature, reports on original investigations. Prerequisite: graduate standing or instructor's consent. Grading system dependent on section. f,w.

415—Medical and Veterinary Entomology (3). Insects, related pests of humans, animals. Special attention to those transmitting diseases. For advanced students in entomology, medicine, sanitary engineering. Prerequisites: 208 and 304 or instructor's consent. w, even years.

419—Insect Ecology (3). Ecological aspects of insect populations and communities including population dynamics, predator-prey interactions, competition, diversity and stability. Quantitative methods are emphasized. Prerequisites: 208 and 209A Statistics 207; Biological Science 362. w, even years.

420—Insect Toxicology (3). Mode of action, metabolism, and relation of chemical structure to toxicity of insecticides. Recent developments in insecticides, attractants, repellents, and chemosterilants. Prerequisites: 10 hours Entomology or instructor's consent. f, even years.

450—Research (1-99). Original investigation not leading to preparation of dissertation.

490—Research (1-99). Original research in economic entomology, biological control of insects, insect taxonomy, toxicology, morphology, physiology, ecology, behavior, forest entomology, and medical and veterinary entomology. Reading knowledge of French, German, desirable. Prerequisite: 20 hours Entomology. Graded on S/U basis only.

PEST MANAGEMENT

209—Principles of Weed Science (4). (same as Plant Science 209). Principles of weed invasion, reproduction, and persistence; of interference; of the relationship between production practice and weed problems; and of the approaches for preventing weed emergence, minimizing weed competition, and reducing weed propagules. Prerequisites: Agronomy 30 or Biological Science 12 or equivalent. w.

305—Theory and Concepts of Plant Pathology (3). (same as Plant Pathology 305, Forestry 305).

309—Herbicides in Agronomic Habitats (3). (same as Agronomy 309 and Horticulture 309).

370—Advances in Insect Pest Management (3). (same as Entomology 370).

Environmental Design

College of Human Environmental Sciences
137 Stanley Hall (573) 882-7224

FACULTY

Ruth Brent, chair, professor, PhD, University of Minnesota.

Habib Chaudhury, adjunct instructor, MS, Texas A&M.

Richard Helmick, professor, MFA, Ohio University.

Howard Marshall, adjunct professor, PhD, Indiana University.

Kate Rogers, professor emerita, EdD, Columbia University.

Gary Hennigh, associate professor emeritus, MFA, University of Colorado.

Ronald Phillips, associate professor, ArchD, University of Michigan.

Benyamin Schwarz, associate professor, PhD, University of Michigan.

Pat Hilderbrand, assistant professor, MA, University of Missouri.

Atiya Mahmood, Instructor/State Extention Specialist, MS, University of Missouri.

Daniel Naegele, assistant professor, PhD, University of Pennsylvania.

Maria Sieira, assistant professor, MArch, University of Pennsylvania.

DEGREES: MA in Design with Digital Media
MS in Environmental Design
PhD in Human Environmental Sciences

Environmental design is an instructional program that describes the processes, procedures, observations and techniques essential to the development of designs for human living, leisure and work environments. It can be placed between the world of physical realities and the imaginary.

Environmental design uses sciences; the exact science for its stability and durability with its visual, thermal, and acoustic capabilities and the social sciences for better understanding of people's relationship with places and time.

The Department of Environmental Design emphasizes:

- Environment and behavior studies focusing on design of the physical setting responsive to culture, income, and life span diversity of people; and
- Design communication as an integral part of the design process, focusing on graphic ideation and the application of computer technology.
- Synthesis of the functional, technological, aesthetic and symbolic attributes of interior design and architecture occurs in departmental course work. Consistent attention is placed on planning and design of physical environments that support human needs and aspirations. Curriculum requirements include courses in supportive areas such as the human and physical sciences, art, humanities, and allied design professions.

The department offers an emphasis in ***Design with Digital Media*** leading to a MA degree, and an emphasis in ***Environment and Behavior Studies*** leading to the MS and PhD degrees.

Teaching or research assistantships and scholarships are available to graduate students.

PROFESSIONAL OPPORTUNITIES: Career opportunities for master's and PhD graduates of the department and college include leadership positions in design and consulting practices in industry, government and education; and academic and administrative positions in higher education and research.

Graduates from the MA degree program pursue careers in the design professions, education,

as well as in the advertising and entertainment industries.

Graduates of the MS and PhD degree programs pursue academic and professional careers integrating environmental design theory with their research skills.

EXPERIENCE IN DESIGN RESEARCH AND CREATIVE ENDEAVOR: The creative project-based MA program of study is often undertaken in preparation for careers in the design professions, education, as well as in the advertising and entertainment industries. The project is conducted in the area of architectural representation using high-end computer animation software. The culmination of the degree is a professionally reviewed, visual project employing digital media.

The design and research-based MS program of study is often undertaken in preparation for professional practice or design education. The project is conducted in emphasis areas as described below. Within each of these emphases, specific course work is chosen based on subject matter, the type of design project, and its research application. The culmination of the degree is a professionally reviewed design project with supporting written report.

The research-based MS program of study is often undertaken as preparation for the doctoral degree. Research is conducted in one of two emphasis areas — environment and behavior studies or design communications. Within each of these emphasis areas, specific course work is chosen based on subject matter and the type of research method selected — quantitative, qualitative or a combination of both. The culmination of the degree is the written research thesis employing quantitative, qualitative or both research methods.

The PhD is a research-based program of study leading to the written doctoral dissertation. The dissertation is distinctive because it demonstrates the ability to conceive and execute scholarly research, and it makes a contribution of "new knowledge" to the discipline. Research is conducted in one emphasis area — environment and behavioral studies. Specific course work is chosen based on subject matter and the type of research method selected — quantitative, qualitative or a combination of both.

MS and Ph.D. students must complete a final oral examination with approved faculty committee and submit a presentation proposal at a professional conference or a manuscript in a professional journal.

ENVIRONMENTAL DESIGN EMPHASES

Design with Digital Media

(creative project leading to MA)

- **Architectural Representation using High-end Computer Animation Software**

Environment and Behavior Studies

(design project or research leading to MS, research leading to Ph.D.)

- **Environment and Aging**
  - Aging in Place
  - Long-term Care Design
    - Nursing Homes
    - Assisted Living Arrangements
    - Special Care Units for People with Dementia
  - Quality of Life and Design
  - Retirement Migration
  - Rural Environments
- **Environmental Design Education**
- **Health Care**
- **Housing**
- **Organizational Systems and Design**
  - Community/Neighborhood Design and Sustainability
  - Facility Management and Design
    - Programming, Design, and Post-occupancy Evaluation
    - Corporate, Institutional, and Professional Training
    - Private Consultation Practice
  - Participatory Design Processes
- **Popular Culture and Design**
- **Universal Design/Accessibility**

INTERDISCIPLINARY EMPHASES

Historic Preservation: The Department of Art History and Archaeology offers an interdisciplinary minor in historic preservation. Departments in several colleges offer courses about this multifaceted and growing field of study. Besides environmental design, those departments include anthropology, art history and archaeology, English, geography, history, and textile and apparel management.

For students in environmental design, a set of courses in preparation for a career in historic preservation may be carefully mapped out in consultation with environmental design faculty and Howard Marshall (professor of art history and archeology, adjunct professor of environmental design).

Gerontology: A graduate interdisciplinary minor in gerontology at the master's and doctoral levels is available to students who are interested in the study of aging and the aged. It provides an opportunity to study the area intensively as part of the regular degree program. Those working toward graduate degrees in human environmental sciences, adult and higher education, anthropology, economics, extension education, political science, social work and sociology may find study in gerontology helpful in both the pursuit of their academic research and the practical problems involved in their careers.

For more information on procedures and requirements for the graduate interdisciplinary minor in gerontology for master's and doctoral degrees, write or call professors Ronald Phillips or Ruth Brent in the Department of Environmental Design, 137 Stanley Hall, Columbia, MO 65211, (573) 882-7224, or David Oliver, Health Services Management, 326 Clark Hall, Columbia, MO 65211, (573) 882-6178.

ADMISSION

Admission to the master's or PhD programs in environmental design requires the following:

- Application.
- Statement of graduate goals and educational objectives discussing: which of the department's emphasis areas is of interest; intentions regarding MA, MS, or PhD; and request for a specific adviser.
- Graduate Record Examination (GRE) scores: students will be considered for admission if scores are above 500 in each of three categories: verbal, analytic and quantitative. (Under unusual circumstances, GRE scores above 450 are considered.) For international students from non-English speaking countries, a minimum TOEFL score of 550 is required instead of the GRE verbal score criterion. General correspondence regarding the GRE registration, test centers, admission tickets, score reporting and the test itself should be addressed to: Graduate School, 210 Jesse Hall, Columbia, MO 65211, (573) 882-6311.
- Three (3) letters of recommendation (excluding MU Environmental Design faculty).
- All undergraduate transcripts (3.0 average (A=4.0) on the last 60 hours of the baccalaureate program is required).
- TOEFL scores (for international students from non-English speaking countries) of 550 or above. If below 550, international students will enroll in the English Language Support Program (ELSP) to achieve a 550 score and then they may begin their graduate program in the department.
- For MA applicants only, portfolio of slides, prints and/or publications. (Do not mail originals.)

Environmental Design graduate and doctoral faculty review the completed file and determine admission status. Each admitted student will be assigned an adviser. If advising reassignment is appropriate, the director of the graduate program will facilitate the process.

Application Deadlines: For admission into the fall semester (August to December), the deadline for submission of application materials is April 1; for the winter semester (January to May), the deadline is October 1.

GRADUATE PROGRAM REQUIREMENTS

In consultation with one's graduate adviser, each student is required to enroll in "core" courses appropriate to his/her degree program. The core courses include the following:

- EDn 323—Computer Graphic Application for Design I (MA only)
- EDn 350—Readings (MA, MS, and PhD—to familiarize student with basic knowledge of the field)
- EDn 410—Seminar (MA, MS, and PhD)
- EDn 412—Research Methods (quantitative-based MS and/or PhD only)
- EDn 415—Readings (thesis- and dissertation-specific; MS and PhD only)
- EDn 423—Computer Graphic Application for Design II (MA only)
- EDn 442—Design Theory (MA only)
- EDn 450—Research (MA only)
- EDn 460—Dissertation Proposal (PhD only)
- EDn 461—Pilot Project for Dissertation (PhD only)
- EDn 462—Environment and Behavior Theory Seminar (MS and PhD only)
- EDn 480—Thesis Project Proposal (MA, MS, and PhD)
- EDn 490—Research (MS and PhD only)

The academic program should be established in consultation with an adviser by the end of the

first full semester of residence.

COURSES

221—Design Communication I (3). Beginning studio course in techniques and conventions of graphic communication as an aid in the design process for interior designers. Prerequisites: Industrial Education F301 or equivalent; Art 60 or equivalent. f.

231—Building Technology for Interior Design (3). Integrated systems of structure, construction, and invironmental comfort. concepts of loading; building geometry; materials; interior systems; environmental comfort and safety. Prerequisites: EDn 120, Math 10.

232—Resources and Materials (3). Furniture, finishes, fixtures, equipment and lighting for interior design specifications and installation. Professional liabilities, regulations, and performance criteria. Prerequisites: TAM 180, Math 10 EDN 120, 231. w.

282—Interior Design Studio I (4). Introductory Design problem solving synthesizing pre- and corequisite course work. Prerequisites: 162, 181, 190, instructor's consent. Corequisites: 221, 231, 341, and 361. f,w.

283—Interior Design Studio II (4). Continuation of 282. Intermediate design problems solving, synthesizing material from pre-and co-requisites: Prerequisite: 282, and instructor's consent. Co-requisites: 232, 322, 242, and 362. f,w.

300—Problems (1-99). Supervised independent work. Prerequisites: 200-level course in field of problem and junior or senior standing and instructor's consent.

318—Topics (1-99). Selected current topics in field of interest.

322—Design Communication II (3). Advanced studio course in techniques and conventions of graphic communication as aids in the design process. Prerequisite: 221. w.

323—Computer Graphic Application for Design (3). Introduces applications of computer graphics for design and art; includes visualization, animation and creative development. Prerequisite: junior standing. May repeat up to 12 credit hours maximum.

341—History of the Designed Environment to 1750 (3). An in-depth study of the designed environment including housing interiors, and furniture of the major historical periods from prehistory to the Industrial Revolution. Prerequisites: Art History 10 or 11.

342—History of the Designed Environment after 1750 (3). An in-depth study of the designed environment, including housing, interiors, and furniture of the major historical periods from the Industrial Revolution to today. Prerequisties: Art History 10 or 11. w.

350—Readings (1-99). Readings in recent research materials. Prerequisite: graduate standing.

355—Recent Trends (1-99). For upper-class and graduate students who wish additional knowledge and understanding in specific subject matter areas.

361—Housing Concepts and Issues (3). Evaluate housing policies, regulations, codes, programs; global and ecological perspectives of environment and behavior; historic preservation; financial issues; trends and projections. Prerequisite: junior standing, three hours each of sociology, psychology and economics. f.

362—Environment and Behavior (3). Evaluate relationships between human behavior and environmental design. Survey of environment and behavior theoretical foundations examining how these concepts translate into a more responsive theory of design. Prerequisites: junior standing. w.

372—Design Business Practices (3). Analysis of the basic professional, human, and business skills necessary for the successful practice of interior design. Prerequisites: Anticipated graduation within one year. f.

384—Interior Design Studio III (4). Continuation of 283. Advanced design problem solving, synthesizing material from pre- and corequisite. Prerequisties: 283, and instructor's consent. Corequisites: 372. f,w.

385—Programming for Thesis Design Studio (1). Develop written comprehensive program for thesis design studio project. Supervised by student-selected committee — one departmental thesis advisor and at least on additional faculty member. Prerequisites: 283, and instructor's consent. f,w.

386—Thesis Design Studio (4). Capstone student-defined design problem synthesizing previous course work. Prerequisites: 384, 385 and instructor's consent. f,w.

390—Internship (1-99). Field experience in design under professional and educational supervision. Prerequisites: 146 or equivalent; junior standing; and instructor's consent. S/U graded only.

400—Problems (1-99). Prerequisites: 300-level course in field of problem and instructor's consent.

410—Seminar (1-4). Reports, discussion of recent work in area of concentration.

412—Research Methods (3). A comparative study of quantitative and qualitative methods in environmental design with emphasis on research results and analyses. Lectures and seminar discussions. Prerequisite: 12 hours advanced design.

415—Readings (1-99). Readings in recent research materials. Prerequisite: 350 and graduate standing.

423—Computer Graphic Application for Design II (3). Creative computer graphic modeling, rendering and animation projects related to the academic background and interests of individual students. Prerequisite: 323. May be repeated to 6 hours maximum.

442—Design Theory (3). Formal environmental design theory concerning historical precedents, current aesthetic trends, and design processes. Assignments investigate philosophical influences, architectonic vocabularies, and communication of idea and artifact. Prerequisite: graduate standing or instructor's consent. May be repeated up to 12 credit hours.

450—Research (1-99). Independent research leading to a creative project.

460—Dissertation Proposal (1). A formal dissertation proposal is written and presented to the dissertation committee for approval. Prerequisite: instructor's consent.

461—Pilot Project for Disseration (1-99). Working with advisor, student proposes, conducts, and reports the findings from a pilot study germane to the dissertation topic in preparation for the dissertation research. Prerequisite: instructor's consent.

462—Environment and Behavior Seminar (3). Synthesis of environment and Behavior themes in design research and application to professional practice. Research on sociobehavioral phenomena, user groups, places. Emphasis on integrated interactive character of elements. Prerequisite: graduate standing or instructor's consent.

480—Thesis Project Proposal (1). The formal opportunity to express the intent and scope of the thesis project. Prerequisite: instructor's consent.

487—Graduate Design Studio (1-99). Advanced graduate level design experience emphasizing project complexity, design skill refinement, and optional development of thesis project strategies. Prerequisites: instructor's consent. f,w.

490—Research (1-99). Independent research leading to thesis or dissertation. Graded on a S/U basis only.

Exercise Physiology Graduate Program

College of Human Environmental Sciences
217 Gwynn Hall (573) 882-4288
Fax: [573] 882=0185
e-mail: ThomasTR@missouri.edu

Exercise Physiology develops new knowledge in the area of exercise training and physiology, including attitudes and behaviors associated with exercise, health, movement and sport. The mission of the Exercise Physiology Graduate Program is to train graduate students who will provide educational services and professional leadership in public and private enterprise, institutions of higher education, schools and other occupational settings.

GENERAL ADMISSION POLICY

MASTER'S: A minimum undergraduate GPA of 3.0 (higher of total cumulative or last 60 hours) is required for unconditional admission.

DOCTORATE: A TOEFL score of 550 is required of all international students for whom English is a secondary language (including master's candidates). A total Graduate Record Examination (GRE) score of 1500 (verbal plus quantitative plus analytical) is desired of all doctoral candidates.

The following is a representative plan of study for the MA degree:

Core Graduate Courses (22)

485	Advanced Exercise Physiology (NS)	3h
484	CV Health and Fitness (NS)	3h
334	Human Nutrition II (NS) (biochemistry prerequisite)	3h
A454	Quant. Methods I (Regression) (EdPsych)	3h
A455	Quant. Methods II (ANOVA) (EdPsych)	3h
450	Research (NS)	3h
490	Research Thesis (NS)	4h

Electives (Select to give 36 hours total)

386	Exercise Test & Prescription (NS)	3h
481	Sports Conditioning (NS)	3h
A445	Sports Psychology (EdPsych)	3h
333	Human Nutrition II Lab (NS)	2h
336	Human Body Comp. & Nutrition (NS)	3h
436	Nutritional Biochemistry I (NS)	5h
438	Nutritional Reg. Gene Exp. (NS)	5h
333	Vet Cell Biology (VetBioMed)	4h
270	Biochemistry (Biochem)	3h
272	Biochemistry (Biochem)	3h
420	Vet Physiology (Fall section) (VetBioMed)	6h
425	Microvascular Circ. Function (VetBioMed)	3h
305	Mammalian Physiology (Physiol)	4h
405	Mammalian Physiology (Physiol)	6h
430	CV Physiology (Physiol)	3h

COURSES

280—Prevention and Care of Athletic Injury (2). Theory, practice in prevention, emergency care, rehabilitation of injuries encountered in vigorous games. Prerequisite: Anatomy.

333—Human Nutrition II Laboratory (2). A techniques course in nutrition, usually taken concurrently with 334. Prerequisites: 234, Biochemistry and instructor's consent.

334—Human Nutrition II Lecture (3). Physiological and biochemical aspects of nutrition; functions of methods of measuring nutritional status; various aspects of applied nutrition. Continuation of 234. Prerequisites: 234, Biochemistry or instructor's consent.

336—Human Body Composition and Nutrition (3). Basic concepts of human body composition related alternative models, measurement techniques, and nutritional, physi-

ological, and life-style factors. Prerequisite: 234. Graded on A/F basis only. w.

380—Kinesiology (3). Study of the relationships of physical laws, mechanical principles, and structural parameters to the analysis of human motion, with emphasis on application to daily activities, sport/athletic performance, and developmental exercise. Prerequisite: Anatomy 201.

381—Advanced Athletic Training (3). Advanced study in areas of prevention, evaluation, care, and treatment and rehabilitation of athletic injuries at high school and college level. Letter grading. Prerequisite: 280.

385—Physiology of Exercise (3). Effects of exercise on the human organism; physiologic capacity and limitation for activity; role of exercise in health and fitness. Prerequisite: Physiology 201 (Anatomy 201 recommended.

386—Exercise Prescription (3). Course investigates theory and methods of testing and prescribing exercise for circulatory fitness, body composition, muscle strength, joint and muscle ranges in motion, and posture. Prerequisites: 385 and HRP 375.

390—Field Training (cr. arr.). Prerequisites: junior or senior standing and instructor's consent.

391—Internship in Nutritional Sciences (1-6). Combines study, observation and employment in an area of food science and nutrition. Written reports, faculty evaluation. Prerequisites: 90 hours including 3 courses in department and instructor's consent.

434—Nutrition in Human Health (3). (same as Nutrition 434). Nutritional aspects of maintaining human health with emphasis on chronic disease prevention. Grades based on classroom particpation and four exams. Prerequisites: Biochemistry 270 and 272; 300-level nutrition course.

436—Nutritional Biochemistry of Carbohydrates I (3). (same as Nutrition, Biochemistry, and Animal Science 436). Provides a critical understanding of current developments in lipid metabolism in animals and humans, particularly as it relates to nutrition and health. Prerequisite: Biochemistry 270 and 272; at least 1-300 level nutrition course.

438—Nutrient Regulation of Gene Expression (3). (same as Nutrition 438). Current concepts with in-depth coverage of several minerals that illustrate themes in molecular mineral nutrition. Based entirely on research literature and taught in a tutorial format. Prerequisites: Biochemistry 270 and 272; 300-level nutition course.

439—Molecular Biology of Mineral Nutrition (3). (same as Nutrition 439). Current concepts of metal ion transport, intracellular metal trafficking and metal-dependent regulation of gene expression. Based entirely on research literature and taught in a tutorial format. Prerequisites: Biochemsitry 270 and 272; 300-level nutrition course.

450—Research (cr. arr.). Original investigations, usually in connection with one of the research projects of Agricultural Experiment Station. Written report required.

481—Sports Conditioning (3). Course covers scientific aspects of preparing athletes for sports competition. Topics range from those related to youth sports to those related to elite performance. Major topics include muscular function, nutrition, and endurance and sprint training. Prerequisite: exercise physiology.

484—Cardiovascular Health and Fitness (3). Physiology underlying best methods for obtaining and maintaining cardiovascular health and fitness. Includes exercise and weight control, plasma lipids, energy metabolism, cardiovascular dynamics, and recent research findings.

485—Advanced Exercise Physiology (3). Lectures, laboratory experiences, and readings in current literature to provide reasonable depth in selected areas of physiology as applied to activity and health. Prerequisites: H385; some Chemistry suggested.

487—Exercise Metabolism (3). Review of major metabolic pathways and the effect of exercise upon them. Special topics include indirect calorimetry, EPOC, anaerobic threshold; weight control, ergogenic aids, and exercise nutrition. Prerequisites: H385 and chemistry (suggested). w.

490—Research (cr. arr.). Original investigation of advanced nature, leading to dissertation. Graded on a S/U basis only.

Family and Community Medicine

School of Medicine
M228 Medical Sciences Building (573) 884-3237
e-mail: mcdonaldp@health.missouri.edu or Jonescl@health.missouri.edu

FACULTY

Harold A. Williamson, chair, professor, MD, MSPH, Case Western Reserve University.

Michael C. Hosokawa, director of graduate studies, professor, EdD, University of Oregon.

Gerald T. Perkoff, curators' professor emeritus, MD, Washington University-St. Louis.

William C. Allen, professor emeritus, MD, MSPH, University of Nebraska.

Jack M. Colwill, professor, MD, University of Rochester.

Robert L. Blake Jr., William C. Allen professor of family and community medicine, MD, Washington University-St. Louis.

Bernard G. Ewigman, professor, MD, MSPH, University of Missouri-Columbia.

Margaret A. Flynn, professor emerita, PhD, University of Missouri-Columbia.

Elizabeth Garrett, professor of clinical family and community medicine, MD, MSPH, University of Missouri-Columbia.

Coleen Kivlahan, professor of clinical family and community medicine, MD, MSPH, Medical College of Ohio.

Michael LeFevre, professor, MD, MSPH, University of Missouri-Columbia.

Daniel R. Longo, professor, ScD, Johns Hopkins University.

Steven C. Zweig, professor, MD, MSPH, University of Missouri-Columbia.

Shanna Swan, research professor, PhD, University of California-Berkeley.

James D. Campbell, associate professor, PhD, University of Missouri-Columbia.

David R. Mehr, associate professor, MD, MS, University of California-San Francisco.

Georgia B. Nolph, associate professor, MD, Women's Medical College of Pennsylvania.

Vicki Straub, clinical associate professor, PhD, University of Arizona.

Daniel C. Vinson, associate professor, MD, MSPH, University of North Carolina.

Joseph A. Beckmann, assistant professor of clinical family and community medicine, MD, University of Missouri-Columbia.

John Delzell, assistant professor of clinical family and community medicine, MD, University of Missouri-Columbia.

Anne B. Fitzsimmons, assistant professor of clinical family and community medicine, MD, University of Missouri-Columbia.

Alan R. Gill, assistant professor of clinical family and community medicine, MD, University of Michigan.

Debra Howenstine, assistant professor of clinical family and community medicine, MD, University of Missouri-Columbia.

Erika N. Ringdahl, assistant professor of clinical family and community medicine, MD, University of Iowa.

Paul Schoephoerster, assistant professor of clinical family and community medicine, MD, University of Minnesota.

Dennis Wen, assistant professor of clinical family and community medicine, MD, East Carolina School of Medicine.

Bridget Early, clinical instructor, MD, Duke University.

Jennifer Hetrick, clinical instructor, MD, Case Western Reserve University.

Jacqueline Ruplinger, clinical instructor, MD, University of Texas Medical Branch at Galveston.

James Stevermer, clinical instructor, MD, MSPH, Washington University-St. Louis.

DEGREE: MS in public health

The Department of Family and Community Medicine has responsibilities for teaching, research and service activities, covering the spectrum from primary medical care to community medicine. The educational objective of the graduate program is to provide health professionals with an opportunity to acquire background, knowledge, attitudes, values and skills in family and community medicine.

The graduate program leading to the master of science in public health includes a combination of course work, research and field experience. Courses are designed to cover the basic sciences of public health. A minimum of 24 months of full-time enrollment should be anticipated. The program requirements include 30 hours of graduate course work and the completion of an original research project.

To qualify for admission, an applicant must be a fully licensed physician who is trained in a primary care specialty. Applicants must be admitted to the Graduate School, submit a completed application and three letters of recommendation.

For additional information, write the Director of Graduate Studies in Family and Community Medicine, Health Sciences Center, Columbia, MO 65212.

COURSES

300—Problems (1-3). Directed exploration of community health problems. Prerequisite: instructor's consent.

310—The Health Care System (3). Overview of health care system and relationship between its components. Focuses on changing nature of the system and issues confronting the future health care system. Prerequisite: senior standing. f.

315—Group Process in Community Health (2). Concepts, principles, methods and application of group processes to the health field. Prerequisite: instructor's consent.

317—Planning for Change in Community Health (3). Individual, small group, organization, and community systems and change strategies; resistances to change and evaluation of change activities in these systems. Prerequisites: senior standing and instructor's consent.

330—Statistical Aspects of Public Health (3). Classification and summarization of data used in public health practice and research. Probability, sampling, hypothesis testing. Correct and incorrect use of statistics in the literature. Prerequisites: concurrent registration in 420 or instructor's consent. f.

350—Special Readings (1-3). Extensive reading and critical analysis of classical and current studies in selected areas of community health. Prerequisite: instructor's consent.

400—Problems (1-3). Intensive study of an area of commu-

nity health. Prerequisites: graduate standing & instructor's consent.

410—Principles of Community Health Education (3). Various social, economic, psychological and cultural variables that motivate people toward health practices. Prerequisites: f, graduate standing; w, senior standing and instructor's consent.

411—Methods in Community Health Education (3). Study and practice in applying principles of administration, supervision, consultation, communication, and the change process in the professional practice of a health education specialist. Prerequisite: 410.

412—Planning for Change I (2). Small group, organizational, and community systems and strategies for initiating change activities within these systems. Emphasizes health systems. Prerequisites: graduate standing and instructor's consent.

415—Health Aspects of the Environment (3). Covers the environmental crisis (air pollution, water pollution), radiation, effects of pollutants, environmental sanitation, the occupational environment and effects of selected trace elements. Prerequisites: 330 & 420, or equivalent, or instructor's consent.

420—Principles of Epidemiology (3). Examines methods of study of disease frequency and distribution in populations. Utilizes small group discussions for understanding of current medical literature. Prerequisites: concurrent registration in 330 or equivalent, or instructor's consent. f.

450—Research (1-99.9). Original research in community health not leading to a thesis but requiring a formal research report.

490—Research (1-99.9). Independent investigation of some problem in community health to be presented as a thesis. Graded on a S/U basis only.

491—Field Experience in Community Health (1-99.9). Supervised field experience in approved agencies practicing health and preventive medicine. Opportunity for observation and service participation in various fields of public health. f,w,s.

492—Field Experience in Community Health Education (1-99.9). Field practice in a selected community setting under faculty or other competent supervision. Restricted to students specializing in community health education. Prerequisite: consent of community health education faculty.

Finance

College of Business and Public Administration
214 Middlebush Hall (573) 882-6272

The departments of finance, marketing and management in the School of Business jointly offer the master of business administration and the doctor of philosophy interdisciplinary degrees in business administration. PhD students may pursue a concentration in finance. Program information and requirements are given under **Business Administration.**

COURSES

203—Corporate Finance (3). Financial decision-making in a corporate environment. Time value of money, capital budgeting, cost of capital, working capital management and financial instruments issued by the firm. Prerequisites: completed 45 semester hours, Accountancy 36 and 37, Economics 5 and 4 or 14, or 51 and Statistics 150.

218—Personal Risk Management and Insurance (3). Teaches the importance of risk in personal endeavors and the intelligent handling of such risk. Life, health, auto, homeowner and liability risks are treated. Prerequisite: sophomore standing.

300—Problems (1-99.9). Independent study, reports on selected topics.

305—Topics in Finance (3). Selected topics in finance, insurance or real estate. Offered on an experimental basis.

323—Financial Management (3). Theory and techniques of financial management, study of firm valuation, dividend policy, capital budgeting and capital asset pricing. Prerequisite: 203.

326—Financial Management Policy (3). Application of the concepts and tools of finance to cases in working capital management, capital budgeting analysis and capital structure decisions. Prerequisite: Finance 323; Corequisites: Accountancy 346 or 305, senior standing.

328—International Finance (3). Application of domestic corporate finance to the international arena. Emphasis on international capital budgeting, working capital management, foreign exchange risk management, international capital markets, balance of payments, internationalmonetary system, and exchange rate determination. Prerequisites: 323, senior standing.

333—Investments (3). Security valuation and analysis, formulation of personal and professional investment programs. Prerequisite: 203. Corequisite: Accountancy 326 or 305.

340—Principles of Real Estate (3). Principle factors influencing land use, practices in real estate business. Prerequisites: 203, Management 254 or senior standing.

341—Real Estate Appraisal (3). Procedures for valuing industrial, commercial, residential realty by market, income, replacement cost approaches. Case method, field investigations. Prerequisite: 340 and senior standing. w.

342—Real Estate Finance and Investment (3). Financing of residential, commercial, and industrial real estate and real estate development. Instruments, institutions, and markets; role of government agencies; investment qualities of real estate. Prerequisite: 340 and senior standing. w.

343—Financial Intermediaries and Markets (3). Functions of intermediaries in the aggregation and allocation of funds, creation and transfer of assets, and distribution of risks. Regulation of financial institutions; financial institutions as instruments of public policy. Prerequisites: 203 and Economics 229.

353—Security Analysis (3). Classifies and analyzes securities, markets, industries. Formulation of investment policy for institutions, aggressive personal investors. Prerequisites: 333 and Accountancy 346 or Accountancy 305, senior standing.

355—Portfolio Management (3). Development and application of the principles of modern port- folio theory to financial assets. Analysis of the concepts of diversification, portfolio construction, portfolio revision, and use of types of financial assets in effective portfolio management. Prerequisite: 333 and senior standing.

357—Financial Futures and Options (3). A basic overview of financial futures and options markets. Topics include: theoretical pricing of financial futures contracts and stock options, institutional aspects of these markets, hedging, and speculative strategies. Prerequisites: 333 and senior standing. w.

363—Management of Financial Institutions (3). Operating principles of major financial intermediaries, including commercial banking, savings, insuring, lending and investing institutions. Analysis of cases; study of current problems. Prerequisite: 343 and senior standing.

390—Professional Finance Internship (3). Provides students experience with financial activities in business organizations (or, occasionally, in a governmental or not-for-profit setting). Students are required to prepare and execute a plan of study approved by the instructor and to complete written assignments detailed in the plan. Prerequisite: B&PA students with Finance concentration and instructor's consent.

400—Problems (1-3). For independent investigation and analysis, graduate students select topics suggested by the foregoing undergraduate courses.

403—Seminar in Business Finance (3). Advanced theory, investigation of current research in financial management.

405—Topics in Finance (3). Selected topics in finance, insurance or real estate. Offered on experimental basis. Prerequisite: instructor's consent.

418—Business and Economic Research (3). (same as Management 418). Role of theory, principles, concepts, and hypotheses in research; models; data collection; basic and applied research; problem solving and decision making; planning and conducting research projects.

423—Advanced Financial Management (3). Examination of the modern theory of finance. Capital budgeting capital structure, dividend theory and valuation. Prerequisite: Business Administration 344.

424—Working Capital Management (3). Financial planning and short-term financial management; integration of quantitative techniques, microeconomics, and financial decisions; analysis of decisions about profit planning, financial forecasting, accounts receivable, cash management, and financial short-term assets. Prerequisite: 423.

425—Capital Budgeting (3). An investigation of long-term financial decisions. Topics include capital budgeting, leasing, long-term financing. Extensive use of cases. Prerequisite: 423.

433—Security Markets and Investments (3). Valuation of securities including stocks, bonds, options and futures; risk-return analysis of financial assets. Prerequisite: Business Administration 344 or equivalent.

435—Seminar in Investment Analysis (3). Develops integrated theory and analytic techniques for evaluating investment potential of financial instruments. Emphasizes corporate securities. Selected cases and readings.

443—Financing Multinational Business (3). Unique problems of financing inter- and intra-national investment, operation, trade of private multinational business. Analysis of cases illustrating theoretical, environmental, functional, institutional consideration.

453—Investment Policy and Portfolio Management (3). Intensive study of investment policies and procedures with emphasis on construction and management of portfolios of institutional investors. Application of programming techniques to selection and administration of securities.

457—Derivative Financial Securities (3). Comprehensive overview of derivative securities including financeial futures and options, swaps, and financial engineering. Major topics: institutional aspects of these markets, advanced pricing models, pricing relationships among derivative securities, and risk shifting. Prerequisite: 433. w.

461—Financial Markets (3). Operations and structure of financial markets, including stock markets, bond markets, mortgage markets, and derivatives markets. Prerequisite: BA 344

463—Management of Financial Institutions (3). Study and analysis of policies, goals, practices and organizational changes in the management of financial institutions and intermediaries. Prerequisite: Business Administration 344.

473—Case Research and Development (3). Planning, conducting, researching and writing business cases.

480—Topics Seminar (1-3). Reading and critical evaluation of selected current finance literature and research. Prerequisites: Ph.D. students only. Departmental consent. May be repeated. Graded on S/U basis only.

490—Research (1-99.9). Thesis research for Ph.D. degree. Graded on a S/U basis only.

Fisheries and Wildlife

School of Natural Resources
College of Agriculture, Food and Natural Resources
302 Anheuser-Busch Natural Resources Bldg.
(573) 882-3436

FACULTY

John R. Jones, program leader, professor, PhD, Iowa State University.

Ronald D. Drobney, director of graduate studies, cooperative associate professor, assistant unit leader—wildlife, Missouri Cooperative Fish and Wildlife Research Unit, PhD, University of Missouri-Columbia.

John Faaborg, professor, PhD, Princeton University.

Leigh H. Fredrickson, professor, PhD, Iowa State University.

Charles F. Rabeni, cooperative professor, unit leader—Missouri Cooperative Fish and Wildlife Research Unit, PhD, University of Maine.

David Galat, cooperative associate professor, assistant unit leader—fisheries, Missouri-Cooperative Fish and Wildlife Research Unit, PhD, Colorado State University.

Robert S. Hayward, associate professor, PhD, The Ohio State University.

Charles H. Nilon Jr., associate professor, PhD, State University of New York-Syracuse.

Douglas B. Noltie, associate professor, PhD, University of Western Ontario.

Mark R. Ryan, associate professor, PhD, Iowa State University.

Mary Ratnaswamy, assistant professor, PhD, University of Georgia.

Peter Blums, research assistant professor, PhD, Latvian University.

Vincent J. Burke, research assistant professor, PhD, University of Georgia.

Joseph B. Hunn, adjunct assistant professor, PhD, Michigan State University.

Susan B. Jones, adjunct assistant professor, PhD, University of Missouri-Columbia.

Frank R. Thompson III, cooperative assistant professor, project leader—United States Department of Agriculture, Forest Service, North Central Forest Experiment Station, PhD, University of Missouri-Columbia.

FISHERIES AND WILDLIFE DEGREES: MS and PhD in fisheries and wildlife.

Graduate programs in fisheries, limnology or wildlife are designed to prepare students for careers with state and federal agencies, consulting firms, private conservation organizations or academic institutions.

In 1998, the Fisheries and Wildlife Program moved into the new Anheuser-Busch Natural Resources Building. This building provides space for faculty and graduate student offices in close proximity to well-equipped research and teaching laboratories, classrooms and computer facilities. In addition, the Thomas S. Baskett Wildlife Research and Education Center, including 2,400 acres with a 20-acre lake, offers a diversity of habitat for field-oriented studies. The University has established the Gaylord Memorial Wildlife Research Laboratory near Puxico, Missouri. Located on the Missouri Department of Conservation's Duck Creek Wildlife Area and next to the Mingo National Wildlife Refuge, the laboratory is in the last of the Missouri swamps.

The Missouri Cooperative Fish and Wildlife Research Unit is affiliated with the school. The unit, operated through a cooperative agreement among the University of Missouri System, the Missouri Department of Conservation and the United States Department of Interior, is staffed with three Department of Interior scientists. These scientists are members of the University faculty, offering graduate-level courses and directing graduate student research.

The School of Natural Resources also maintains an extensive teaching and research collection of the vertebrate animals of Missouri and surrounding states. The bird and mammal collections contain more than 7,000 specimens. The Glen Smart waterfowl collection consists of more than 200 species of mounted waterfowl of the world. The fish collection contains about 25,000 preserved specimens, including fishes from Missouri and the Midwest; saltwater fishes from the Atlantic, Pacific and Gulf coasts; and about 3,000 freshwater and saltwater fishes from Thailand.

An applicant contemplating graduate work in fisheries, limnology or wildlife should have a good background in the biological and physical sciences, including biology or botany, zoology, ecology, physiology and genetics. In addition, such taxonomic courses as plant taxonomy, invertebrate zoology, ichthyology, ornithology and mammalogy are highly desirable, as is a background in chemistry, mathematics and physics. A background of 25 to 30 hours in biological sciences courses is desirable. Major deficiencies in this area will be remedied during the graduate program.

Background in resource management helps distinguish our program from basic biology. Therefore, course work in fisheries or wildlife management, environmental science, resource policy or other applied ecology fields is desirable.

Admission is based upon the following criteria:

- The GRE general test
- Three letters of recommendation from people who can attest to the candidate's scholastic ability
- The undergraduate scholastic performance. A 3.0 (A=4.0) or higher GPA is highly desirable, with particular attention given to the last two years of undergraduate study or to experience subsequent to graduation.

A limited number of fellowships and teaching and research assistantships are available for qualified students.

MASTER'S DEGREE: To attain the master's degree a student must complete, with a B average or better, 30 hours of course work (15 hours or more at the 400 level). Research, problems, special investigations and special readings courses shall not exceed 12 of the 30 hours. Candidates are expected to design a study plan and review this plan with their advisory committee during their first semester in residence.

A thesis acceptable to the student's graduate committee shall be completed before the final oral examination, which is given to all candidates before completion of the degree.

DOCTORAL DEGREE: The objectives of and the requirements for a PhD in fisheries and wildlife are the same as those detailed for the PhD in forestry.

For additional information write or call the Director of Fisheries and Wildlife Graduate Studies, 302 Anheuser-Busch Natural Resources Bldg., Columbia, MO 65211, (573) 882-3436.

COURSES

266—Ornithology (4). (same as Biological Sciences 266). Structure, identification, habits, importance of regional birds. Field work, lectures, lab. Prerequisites: 5 hours Biological Sciences or instructor's consent. w.

298—Senior Honors Research (1-3). Prerequisites: 3.30 GPA and instructor's consent. f.

299—Senior Honors Research (1-3). Prerequisites: 3.30 GPA and instructor's consent. w.

300—Problems (1-99.9). Topics in forestry, fisheries and wildlife. f,w,s.

301—Topics in Fisheries, & Wildlife (1-99.9). Organized study of selected topics. Intended for upper division and graduate student. Subjects and credit may vary from semester to semester. f,w,s.

307—Mammalogy (4). (same as Biological Sciences 309). Taxonomy, distribution, structure, habits, importance of mammals; emphasizes those of central United States. Prerequisite: junior standing or instructor's consent.

311—Ichthyology (4). (same as Biological Sciences 311). A broad introduction to the biology and ecology of fishes. Emphasis will be placed on understanding the adaptations fishes exhibit to aspects of their environment. Prerequisite: 8 hours Biology or equivalent.

316—Waterfowl Biology and Management (3). Taxonomy of waterfowl of the world. Emphasis on ecology, behavior, population dynamics, physiology and management of North American waterfowl. Prerequisites: 266 or instructor's consent. f, even years.

323—Wildlife Research and Management Techniques (4). Research and Management methods for wildlife populations and their habitats. Prerequisite: 70. Weekend field trips required. f.

324—Limnology (3-4). (same as Biological Sciences 324) (lecture/lab: 4 hrs.; lecture only: 3 hrs.) Ecology of inland waters with emphasis on productivity. Prerequisites: senior standing or Biological Sciences 362. f.

325—Introduction to Conservation Biology (3). Introduction to principles of conservation biology. Application of ecological concepts and conservation biology principles to management of endangered species, biodiversity and threatened ecosystems. Prerequisite: Biological Sciences 362. w.

327—Wildlife Conservation (4). Integrates the biological principles of wildlife conservation with the human dimensions (e.g., political issues) of such efforts in the context of a simulated natural resource agency. Prerequisites: Biological Sciences 362. Letter grading only. f.

328—Fisheries Management (3). Introduction to the scientific principles and techniques of fishery management. Integrates ecological principles with social, economic and legal considerations. Prerequisites: Biology 362 and statistics 185. w.

329—Introduction to Fish Physiology (3). An introduction to the physiological function of fish, particularly at their organ and organ system levels. Application of physiological information to fishery biology will be emphasized. Prerequisites: 311 or equivalent. w, odd years.

331—Aquatic Toxicology (2). Advanced study of the role of toxicants in aquatic environments. Covers organismic, popu-

lation and community responses to different classes of pollutants. Prerequisites: 324 and Biological Sciences 362 or Chemistry 210 or equivalent. w, even years.

333—Animal Population Dynamics and Management (3). Quantitative modeling approach to examining principles and analysis techniques of fish and wildlife population dynamics. Emphasis on approaches useful in the management of exploited species. Prerequisites: 10 hours Biology, Mathematics 207 or equivalent. w.

336—Urban Wildlife Management (3). Reviewing the theory and practice of applying ecological concepts to the management of wildlife species in urban areas. Corequisites: 327, or instructor's consent. f, even years.

350—Special Readings (1-99.9). Critical review of current literature and research in forestry, fisheries and wildlife, and methods of presenting research results. f,w,s.

401—Topics (1-99.9). Organized study of selected topics. Subjects and credit may vary from semester to semester. Prerequisite: instructor's consent. f,w,s.

410—Seminar (1). Discussions of current developments in forestry, fisheries and wildlife, and critical study of research programs. f,w.

424—Urban Ecosystems Seminar (2). Seminar course focusing on current topics in urban ecology and urban ecosystems science. Prerequisites: Biology 362 or permission of instructor.

426—Fish Ecology (3). Advanced study of the interactions between fish and their environment. Topics include behavioral, physiological, population and community ecology of fishes, with emphasis on development and application of ecological theory in fishery management. Prerequisites: 311, 324, Biological Science 362 orequivalent . w.

427—Advanced Limnology (3). Physical, chemical and biological processes of lakes and streams emphasizing biological production, water quality and modern problems. Field, laboratory techniques in limnology research. Prerequisites: 324, Biological Sciences 362, 207 or equivalent . w, even years.

429—Wetland Ecology (3). A survey of the wetlands of North America; emphasis on nutrient dynamics, habitat structure, management, legislation and regulations, and man's impacts. Prerequisites: 324, Biological Sciences 362 and instructor's consent. f, odd years.

431—Freshwater Invertebrate Ecology (3). An examination of the function of invertebrates in lentic and lotic ecosystems. Sampling, life history, distribution and abundance, bioenergetics, secondary production, role as environmental monitors, relationships with fish and waterfowl. Prerequisite: 324. f, odd years.

432—Stream Ecology (3). Ecological principles applied to flowing waters. Emphasis on ecological processes within algal, invertebrate and fish communities. The influence of geomorphic processes, hydrologic principles and physical-chemical factors on the biota. f, even years.

433—Natural Assessment and Modeling (3). Comprehensive study of approaches used to assess habitat attributes, wildlife use of habitats, and modeling species— habitat relationships. Concepts associated with habitat sampling, model construction as well as assumptions associated with habitat assessment will be discussed. Prerequisite: 327. f, even years

435—Wildlife Nutritional Ecology (3). A comprehensive and comparative treatment of vertebrates interact with their environment to satisfy nutrient and energy requirements. Emphasis on nutrient requirements, food processing, bioenergetics and foraging strategies. Prerequisite: Biological Science 362 or instructor's consent. w, even years.

436—Advanced Waterfowl Ecology (3). Advance studies of waterfowl ecology. Emphasis on mating systems, foraging ecology, energetics, and post-breeding and wintering ecology. Prerequisites: 266, 316 and Biological Science 362 or instructor's consent. w, odd years.

439—Conservation Biology/Endangered Species Management (3). In-depth study of the ecological, legal, sociological aspects of the conservation of biodiversity. National and international focus on endangered species conservation; endangered species conservation; review of current literature. Prerequisite: Biological Science 362 or equivalent. f.

440—Vertebrate Behavioral Ecology (3). In-depth study of the behavioral adaptations of vertebrates. Topics include reproductive strategies, mate selection, parental care, predator avoidance, habitat selection, foraging strategies and spacing patterns. Prerequisites: Biological Sciences 342 and 362 or equivalents. w, odd years.

444—Applied Data Analysis (2). Advanced study of statistical procedures for Natural Resources research. Prerequisites: Statistics 385, 395 or instructor's consent. f, even yrs.

450—Research (1-99.9). Original research not leading to preparation of dissertation. f,w,s.

490—Research (1-99.9). Original investigation for presentation in a dissertation. Graded on a S/U basis only. f,w,s.

Food Science

College of Agriculture, Food and Natural Resources

FACULTY

Robert T. Marshall, director of graduate studies, professor, PhD, University of Missouri-Columbia.

Milton E. Bailey, professor emeritus, PhD, Louisiana State University.

Ruth E. Baldwin, professor emerita, PhD, University of Wisconsin.

Harold J. Bassett, professor emeritus, PhD, University of Wisconsin.

Marion L. Fields, professor emeritus, PhD, Purdue University.

Harold B. Hedrick, professor emeritus, PhD, University of Missouri-Columbia.

Hildegarde Heymann, professor, PhD, University of California-Davis.

Fu-Hung Hsieh, professor, PhD, University of Minnesota.

H. Donald Naumann, professor emeritus, PhD, University of Missouri-Columbia.

Nan Unklesbay, professor, PhD, University of Wisconsin.

Andrew D. Clarke, associate professor, PhD, Colorado State University.

Sylvia Gaiko, associate professor, PhD, Oklahoma State University.

Douglas L. Holt, associate professor, PhD, University of Nebraska.

Eugene L. Iannotti, associate professor, PhD, University of Maryland.

James Nordstrom, associate professor, PhD, University of Minnesota (Lincoln University).

James Groves, assistant professor, PhD, Kansas State University.

Ingolf Gruen, assistant professor, PhD, Virginia Tech.

David A. James, assistant professor, PhD, University of Missouri-Columbia.

Carol Lorenzon, assistant professor, PhD, Texas A&M.

Azlin Mustapha, assistant professor, PhD, University of Nebraska.

Dean S. Shelley, assistant professor emeritus, MS, University of Missouri-Columbia.

Timothy Taylor, assistant professor, PhD, University of California-Davis.

DEGREES: MS and PhD in food science

Candidates are prepared for careers in research or advanced professional careers in the food industry, teaching positions in community and junior colleges, four-year colleges and in supporting roles in academe or industry. Graduates also may play leadership roles in extension or other adult education programs, food production and quality assurance, or government agencies. Selected careers include research and development for private industry or the federal government, food plant supervision, technical operation, product development, nutrition, distribution, food service and food regulatory work.

The PhD degree can lead to careers in research, college or university teaching and research, or to administrative positions related to foods.

Departmental cooperation with the food industry is excellent. Special facilities for food science study and research include chemical and microbiological laboratories and pilot plants to study food processing.

Assistantships are available to qualified students from funds provided by the Agricultural Experiment Station, research contracts and grants. Fellowships supported by industry and professional societies, based on national competition, also are available.

Submit application for assistantships or fellowships to the Department of Food Science, 122 Eckles Hall, Columbia, MO 65211. Additional information about courses of study, assistantships, or other material can be obtained from the same office.

THE MASTER'S DEGREE is designed primarily for individuals who are interested in specializing in areas of food science, food service or food distribution. The individual program is built around a core of courses in food science, with supporting courses from the disciplines of chemistry, microbiology, physiology, nutrition, economics, marketing, management and statistics.

Acceptance for advisement requires a bachelor's degree and an undergraduate record that shows promise for successful completion of graduate studies. Departmental selection of students is based on previous academic performance, academic background and potential as determined by the GRE and reference letters.

To satisfy degree requirements, a candidate must:

- Complete an approved program of study
- Prepare a thesis or, if a nonthesis option is chosen, prepare a research paper acceptable in an appropriate refereed journal based on research planned and conducted by the student in concert with the adviser
- Pass a final oral examination over course work and research. The thesis or research paper is reviewed by each member of the final examining committee.
- All MS candidates must prepare at least one (1) manuscript, acceptable for submission to a refereed journal, before approval of the M-2 (Report of the Master's Examining Committee) by the director of graduate studies.

DOCTORAL DEGREE: Requiring a minimum of two years beyond the master's degree,

the doctor of philosophy degree prepares students for teaching, research or other professional careers in food science. A student must:

- Satisfactorily complete the master's degree program or its equivalent with a GPA of 3.0 or better
- Satisfactorily complete the written and oral qualifying examination
- Show evidence of satisfactory performance in the major area of study, inclusive of grade trends and
- Comply with other Graduate School requirements for admission.

The program, to be completed under the guidance of a doctoral program committee, consists of:

- A course of study designed to fit the student's academic background and objectives — one-third of the credit earned under the plan of study is research credit, the remainder is in courses selected from food science and its supporting areas, such as chemistry, microbiology, physiology, nutrition, economics, marketing, management and statistics;
- Acceptance of a dissertation based on research proposed, performed and defended by the student.

To satisfy degree requirements, a candidate must complete the program of study; pass the comprehensive examination over the approved course of study; present an acceptable dissertation and defend it in a final examination; prepare at least one (1) manuscript, acceptable for submission to a refereed journal, before approval of the D-7 (Report of the Final Examination Committee) by the director of graduate studies.

COURSES

200—Problems (1-99.9). Supervised study in a specialized phase of food science and nutrition.

204—Principles of Meat Science (3). (same as Animal Science 204). Study of the principles involved in the conversion of living animals to meat and by-products; efficient utilization of meat as a food. Laboratory stresses the application of scientific principles in the meat industry. Prerequisite: one course in Biology. w.

228—Principles of Food Systems Management (3-4). Organizational structure and relationships; policy making and implementation; budgeting and cost control; menu as a management tool; sanitation and safety; food preparation; and food delivery systems. Prerequisite: 121.

231—Principles of Dairy Foods Science (3). (same as Animal Science 231). Technology, chemistry and microbiology related to milk and its transformation into fluid milk products, fermented dairy foods and spreads. (2 hours of lecture and two hours of laboratory per week.) Prerequisite: organic chemistry. f.

250—Physical Principles for Food Processing (3). (same as Agricultural Engineering 250).

300—Problems (1-99.9). Advanced problems in a selected field of food science and nutrition.

301—Topics in Food Science and and Human Nutrition (1-99.9). Instruction in specific subject matter areas in the field of food science and nutrition.

304—Processing Muscle Foods (3). Materials and technologies for the manufacture of muscle food products from red meats, poultry and seafood. Experience problem-solving through further processing of complex ingredients and develop skills by practicing operations in a pilot plant facility. Prerequisites: Organic Chemistry 115 and FSHN 204 or equivalent. (2 hrs of lecture and 2 hrs of laboratory per week.). w.

305—Food Analysis (3). The quantitative determination of the constituents of food. Prerequisites: Analytical Chemistry and Biochemistry. f.

309—Food Chemistry I (5). Structure, composition and chemical properties of food. Prerequisite: 12 hours Chemistry, including Biochemistry. f.

311—Investigation of Food Properties (3). Study of the chemical and physical properties of foods and the interaction of food components. Lecture and laboratory. Prerequisites: 121 and Organic Chemistry.

324—Food Production in Foodservice Systems (3-5). A lecture/lab/practicum designed to expose students to concepts of quality food production, evaluation of product and resources and food microbiology application in lab/practicum. Prerequisites: 228 or instructor's consent.

328—Management of Food Systems (3). Interactive discussion of current issues in foodservice management. Independent study of varous foodservice facilities using principles of management. Prerequisites: 228, 324.

330—Principles of Food Processing (4). Basic principles of food processing, with emphasis on blanching, pasteurization, commercial sterilization, refrigeration, freezing, concentration, dehydration and packing. Impacts of processing on product quality are evaluated.

331—Frozen, Concentrated and Dry Dairy Foods (3). Technology, chemistry and microbiology related to transformation of milk into frozen, concentrated and dry dairy foods. Prerequisites: Organic Chemistry 115 and FSHN 231 or equivalent. (2 hours lecture and 2 hours lab per week.)

350—Readings (1-99.9). Prerequisites: 8 hours of course work in field of subject and instructor's consent.

360—Food Quality Assurance (3). Interprets regulations concerned with protection of the nation's food supply. Applies protection and sanitary practices to insure consumers of wholesome and healthful foods. Prerequisite: General Microbiology. w.

372—Food Microbiology (3). Study of bacteria, yeast and molds. Includes dominant flora, public health significance, characterization of organisms, examination of foods representative of major food groups, spoilage, preservation, food fermentations and physiological groups. Prerequisites: Bacteriology and Organic Chemistry. w.

373—Food Microbiology Laboratory (2). Examination of foods for microorganisms and characterization of major species. Prerequisite: 372 or concurrently. w.

375—Sensory Analysis of Food (4). Principles, theory, methodology of sensory analysis. Recommended: a statistics course.

390—Field Training (1-99.9). Prerequisites: junior or senior standing and instructor's consent.

391—Internship in Food Science and Nutrition (1-6). Combines study, observation and employment in an area of food science and nutrition. Written reports, faculty evaluation. Prerequisites: 90 hours including 3 courses in department and instructor's consent.

399—Food Product Development (3). Capstone course integrating the various disciplines of food science to create new food products. Prerequisites: English 20, senior in food science and nutrition, or instructor's consent. w.

400—Problems (1-99.9). Individual studies include a minor research problems.

401—Topics in Food Science and Nutrition (1-99.9). Specialized topics in the area of food science and nutrition. Prerequisites: instructor's consent and graduate standing.

402—Research Methods in Food Science (2). Introduction to research. Defining research problems, developing hypotheses, searching scientific literature, designing experiments, presenting data, writing scientific papers and theses, making oral presentations. Prerequisite: graduate standing. f.

404—Meat Investigations (3). Discussion of literature, special reports, assigned readings, techniques, interpretation of results. Prerequisites: 304 and 309.

405—Advanced Microbiology of Foods (4). Principles of microbial physiology, taxonomy, analytical methods applied to study of microorganisms added to foods and those causing food spoilage or food-borne illness. Roles of microorganisms in manufacture/distribution of foods. Prerequisite: 372. f.

409—Food Chemistry II (4). Study of chemical content of food, emphasizing aspects that exist uniquely in food. Prerequisite: 309. w.

410—Seminar (1). Provides students with opportunities for development in depth of advanced aspects of food science through reviews of research in progress and of current scientific publications. f,w.

415—Readings (1-99.9). Prerequisites: 15 hours course work in field of subject and instructor's consent.

417—Food and Industrial Fermentation (3). Microbiological, physical and chemical aspects of the utilization of microbial cultures in controlled fermentations of foods and food constituents. Prerequisites: 6 hours Microbiology and 5 hours Organic Chemistry or Biological Chemistry. alt. w, odd years.

419—Field Training (1-99.9). Internships and/or field experiences under supervision. Prerequisites: graduate standing and instructor's consent.

421—Advanced Experimental Foods (3). Further development of the concepts and experience in planning, conducting, interpreting and reporting food preparation research. Prerequisites: 321 and Statistics at 200 level.

450—Research (1-99.9). Original investigations, usually in connection with one of the research projects of Agricultural Experiment Station. Written report required.

460—Advanced Food Quality Assurance (3). Analyzes concepts of integrating laws, TQM and statistical process control into HACCP and ISO systems required for the quality of the global food industry. Prerequisites: 360; Statistics 207.

470—Advanced Studies in the Science & Technology of Food Preservation (4). Thermal processing of canned foods, fermentation, radiation and freeze-dehydration, food additives. Current literature, lectures, lab discussion. Prerequisites: 309, 330, 372 or instructor's consent. alt. w, even years.

475—Advanced Sensory - Instrumental Analyses (3). Integration of human sensory perception with instrumental analyses. Statistical analyses will be emphasized. Advances in Sensory Techniques will be discussed. Prerequisites: FS&HN 375, Statistics 395.

Forestry

School of Natural Resources
College of Agriculture, Food and Natural Resources
203 Anheuser-Busch Natural Resources Building (573) 882-7242

FACULTY

Carl D. Settergren, program leader, professor, PhD, Colorado State University.

Bruce E. Cutter, director of graduate studies, professor, PhD, University of Missouri-Columbia.

Harold E. Garrett, professor, PhD, University of Missouri-Columbia.

Gray S. Henderson, professor, PhD, Cornell University.

Paul S. Johnson, cooperative professor, United States Department of Agriculture, Forest Service, North Central Forest Experiment Station, PhD, Michigan State University.

William B. Kurtz, professor, PhD, University of Arizona.

Marc J. Linit, professor, PhD, University of Arkansas.
Stephen G. Pallardy, professor, PhD, University of Wisconsin.
Albert R. Vogt, professor, director, School of Natural Resources, PhD, University of Missouri-Columbia.
Robert A. Cecich, adjunct associate professor, United States Department of Agriculture, Forest Service, North Central Forest Experiment Station, PhD, Iowa State University.
John P. Dwyer, associate professor, PhD, University of Missouri-Columbia.
Milon F. George, associate professor, PhD, University of Minnesota.
Richard P. Guyette, research associate professor, PhD, University of Missouri-Columbia.
David R. Larsen, associate professor, PhD, University of Washington.
Felix Ponder, cooperative associate professor, United States Department of Agriculture, Forest Service, North Central Forest Experiment Station, PhD, Southern Illinois University.
Steve R. Shifley, cooperative associate professor, United States Department of Agriculture, Forest Service, North Central Forest Experiment Station, PhD, University of Minnesota.
Rose-Marie Muzika, assistant professor, PhD, Michigan State University.

FORESTRY DEGREES: MS and PhD in forestry.

Graduate research programs leading to the MS or PhD in forestry are designed to prepare students for careers in academic institutions, consulting firms, industry, and state and federal agencies.

Forestry graduates interested in research or teaching may concentrate much of their course work in one or more of the related sciences with a thesis appropriate to forestry. Dissertation research may be directed toward the solution of problems faced by the practicing forester or may consist of fundamental investigations pertinent to the solution of such problems.

Specialized graduate education is available in agroforestry, biometrics, community and landscape ecology, economics, entomology, hydrology, land-use planning, geographic information systems, physiological ecology, physiology, policy, silviculture, soils, forest management, stand dynamics, water quality, wood quality, and tree-ring analysis. Students often conduct joint research with natural resource specialists at the North Central Forest Experiment Station (United States Forest Service), the Missouri Department of Conservation, the Missouri Department of Natural Resources, the National Park Service and the United States Fish and Wildlife Service.

Facilities available for research include well-equipped biometrics, ecology, hydrology, physiology and wood quality laboratories in the Anheuser-Busch Natural Resources Building on campus at Columbia; the Horticultural and Agroforestry Research Center (HARC); the Baskett Research Area; and Schnabel Woods. The HARC is a 540-acre tract about 30 miles northwest of campus near New Franklin, Mo. It is in the loess hills overlooking the Missouri River Valley and is well-suited for agroforestry, agronomic and horticultural field studies. The Baskett Research Area, 20 miles south of Columbia, is 2,300 acres. A field station with weatherized buildings, a shade house and an electronic and machine shop are maintained on the area. Schnabel Woods is an 80-acre old-growth tract in the River Hills region of Missouri. It is near the Missouri River and consists of a variety of hardwood stands ranging in composition from oak-hickory to sugar maple. In addition, lands of the United States Forest Service, United States Fish and Wildlife Service, Corps of Engineers, National Park Service, Missouri Department of Conservation and the Missouri Department of Natural Resources are available for certain studies.

Acceptance for advisement in forestry is based upon undergraduate scholastic performance and/or professional experience. A 3.0 (A=4.0) GPA or better is highly desirable. Particular attention is given to the record of the last two years of undergraduate study, and/or the type and quality of professional experience since completion of the undergraduate degree. Each applicant should have three letters of recommendation submitted by individuals qualified to evaluate their scholarly capacity and professional qualities. Scores on the GRE general exam must also be submitted. Doctoral candidates must demonstrate a higher level of achievement in each of these criteria.

A limited number of research assistantships are available. They are awarded based on the following criteria: 1) demonstrated scholastic accomplishment; 2) scores on the GRE; and 3) experience related to the proposed field of study.

MASTER'S DEGREE: The master's degree in forestry is designed for students with an undergraduate degree in forestry or in one of the biological, physical or social sciences basic to forestry. Students with previous professional education in forestry may wish to undertake preliminary preparation for both research and teaching, or may wish to obtain greater depth in a specialized area. Those without a baccalaureate degree in forestry may wish to further their education in forest science or to attain professional competence by completing course work in forestry. Work required of students without a forestry degree who want a professional forestry education includes courses in dendrology, utilization of forest resources, resource measurements, forest inventory, forest fire control and use, ecology, silviculture, forest photogrammetry, watershed management, forest management, forest economics, public resource policy and land-use planning. Some of these courses do not carry graduate credit.

To attain the master's degree, 30 hours of course work must be completed; 15 hours or more shall be 400 level. Research, problems, special investigations and special readings courses shall not exceed 12 of the 30 hours. The GPA of all course work submitted for the degree must be 3.0 or better.

A thesis, or a minimum of five semester hours of nonthesis research acceptable to the student's committee, shall be completed before the final examination. Research toward a thesis normally shall not exceed eight hours. Thesis requirements and defense are as defined by the MU Graduate School. A final oral examination is given to all candidates before completion of the degree.

DOCTORAL DEGREE: The PhD degree in forestry is designed to prepare students for academic careers in research and teaching or other advanced scientific or professional careers. The student pursuing the doctoral program is expected to pass a qualifying, comprehensive and final examination administered by the student's doctoral committee. This committee is structured as defined by the MU Graduate School and must have representatives from at least two disciplines outside forestry.

The qualifying examination determines whether the student's background is adequate to enter the PhD program. It also is intended to ascertain if there are areas of weakness in which a candidate will be required to gain background through appropriate course work. The objectives of the comprehensive examination are twofold: 1) to determine if a student has acquired sufficient depth and breadth of knowledge in selected areas of concentration; and 2) to evaluate the candidate's capacity to apply that knowledge in solving applied or theoretical problems. The final examination is directed primarily toward exploration of the dissertation research project.

Requirements for foreign language and a collateral field, if any, are determined by the student's doctoral program committee. The doctoral committee is expected to make an assessment of the student's needs as they relate to the student's background and educational objectives.

An independent scholarly dissertation approved by the student's adviser and program committee must be completed in a form acceptable to the doctoral committee.

The PhD degree is conferred only upon those students who, after extensive study, have demonstrated a high level of achievement in their particular specialization in forestry and have completed independent research contributing to knowledge in the field.

For additional information write or call the Director of Forestry Graduate Studies, 203 A-BNR Building, Columbia, MO 65211, (573) 882-7242.

COURSES

204—Wood Technology (3). Structure and identification of commercial woods. Relation of growth to physical and chemical properties of wood. f.

205—Forest Pathology (3). (same as Plant Pathology 205) Study of tree diseases, causal agents and principles of disease control. w.

206—Wood Engineering (3). Mechanical properties of wood, including standard testing procedures, work stresses, and variation in the strength properties of wood. The application of strength data and design of structural elements. f.

207—Forest Fire Control and Use (2). Fundamentals of all phases of fire protection. Objectives and techniques in use of fire. f.

209B—Forest Insects (1). (same as Entomology 209B). Identification, life histories, population dynamics, and management of insects in forest environments. Prerequisite: concurrent enrollment or previous satisfactory completion of Entomology 208.

290—Urban Forestry (2). The culture and management of trees in urban areas, including ownership patterns, species composition, growth environment, amenities provided and evaluation. One-day field trip required. Prerequisites: 151 or Plant Science 211, or instructor's consent. w, odd years.

298—Seniors Honors Research (1-3). Prerequisites: 3.30 GPA and instructor's consent. f.

299—Senior Honors Research (1-3). Prerequisites: 3.30 GPA and instructor's consent. w.

300—Problems (1-99.9). Topics in forestry, fisheries and wildlife. f,w,s.

301—Topics (1-99.9). Organized study of selected topics. Intended for upper-division and graduate student. Subjects and credit may vary from semester to semester. f,w,s.

302—Forest Ecology (3). Lectures and Labs on the interrelationships of forest vegetation and the environment. Prerequisites: Forestry 151 or Biological Science 214 or consent.

303—Practice of Silviculture (3). Applied ecological principles, cultural practices, tree improvement techniques and treatments to forest stands and other lands for systematic production of goods and services. Prerequisite: 302. w.

304—Tree Physiology (3). Lectures on physical and chemical phenomena involved in the functions and activities of trees. Prerequisites: Biological Sciences 12; Chemistry 32 or instructor's consent.

305—Theory and Concepts of Plant Pathology (3). (same as Plant Pathology 305, Pest Management 305). w.

306—Forest Photogrammetry (2). Introductory interpretation of aerial photographs as these may be used in evaluating or measuring a variety of forest land uses and products. f.

309—Watershed Management (3). Principles of managing watersheds, including effect of vegetation on soil erosion, soil moisture, and stream flow. Prerequisites: 141 or instructor's consent. f.

314—Forest Resource Management (3). Teaches resource managers how to develop a plan for the management of forest resources using managerial, economic, silvical and wildlife techniques for its enhancement and to meet the landowner's objectives. Prerequisites: 303 and 318. f.

318—Forest Economics (3). Economic principles applied to production/marketing of goods and services from forest land: emphasizes capital and land factors and investment alternatives related to time. Prerequisites: Mathematics requirement completed; Agricultural Economics 40, 41, or 70. w.

350—Special Readings (1-99.9). Critical review of current literature and research in forestry, fisheries and wildlife, and methods of presenting research results. f,w,s.

370—Logging Systems: Operations and Analyses (3). A systems approach to timber harvesting from acquisition through engineering to log transport. Regional aspects and influences will be considered. Prerequisites: 143, 144. w, odd years.

401—Topics (1-99.9). Organized study of selected topics. Subjects and credit may vary from semester to semester. Prerequisite: instructor's consent. f,w,s.

403—Low Temperature Physiology of Plants (3). Physiologic bases of resistance and adaptation of plants to chilling and freezing temperatures. Prerequisite: Biological Sciences 313 or equivalent. Letter grading. w, odd years.

405—Forest Soils (3). Physical, chemical and biological properties of forest soils in relation to tree growth. Prerequisites: 303 or instructor's consent. f, even years.

407—Applied Silviculture (3). Ecological and economic factors affecting application of silviculture in each of eighteen forest regions in United States. Prerequisite: 303. f.

410—Seminar (1). Discussions of current developments in Forestry, Fisheries and Wildlife, and critical study of research programs. f,w.

414—Advanced Forest Management (3). Modern quantitative methods to facilitate decision-making in harvest scheduling and regulation, land use allocation, and production planning in natural resource management. Prerequisite: 314. w. odd, yrs.

416—Applied Research Methodology (2). Interrelated roles or logic, observation experiment in scientific method, research components, ethical aspects, scientific publication and communication, and research direction. Prerequisite: instructor's consent. f, odd yrs.

417—Advanced Forest Mensuration (3). Statistical approach to forest inventory and experimental designs. Growth estimates. Use of computers in forest inventory. Review of current literature on survey methods. Prerequisites: 211 or instructor's consent. w, odd years.

418—Social Forestry (3). Issues with using forestry as an international development tool; planning, implementing and evaluating farm and community forestry projects. Prerequisite: Forestry 318, or Ag Econ 270, or equivalent and instructor's consent.

421—Plant Water Relations (3). Absorption, translocation, utilization and loss of water by plants . Biophysics of water movement in the soil-plant-atmosphere continuum. Effects of water deficits on physiological processes. Prerequisite: Biological Science 313 or equivalent. w, even years.

423—Plant-Water Relations Laboratory (2). Introduction to techniques and instrumentation used in studies of plant-water relations. Corequisite: 421. w, even years.

425—Tree Growth-Quality Relationships (3). Response of tree growth (wood formation) to such environmental influences fertilization, moisture, nutrient supply, wounding pruning, etc. Prerequisites: 204 or 303 or instructor's consent. w, odd years.

450—Research (1-99.9). Original research not leading to preparation of dissertation. f,w,s.

490—Research (1-99.9). Original investigation for presentation in a dissertation. Graded on a S/U basis only. f,w,s.

Genetics Area Program

311 Tucker Hall (573) 882-2816
Fax: [573] 884=9676
Toll free: 1-877-GENE-PhD (436-3743)
http://www.missouri.edu/~genetics

FACULTY

Donald L. Riddle, chair, professor of biological sciences/director of the molecular biology program, PhD, University of California-Berkeley. Developmental genetics, neurobiology, cellular signaling, and the molecular genetics of aging in the nematode *C. elegans.*

Stephen Alexander, professor of biological sciences, PhD, Brandeis University. Molecular genetics and cell biology of *Dictyostelium* development.

James A. Birchler, professor of biological sciences, PhD, Indiana University. Gene expression in *Drosophila* and maize.

Arun K. Chatterjee, professor of plant pathology, PhD, University of Guelph. Plant-microbe interaction; virulence genes in plant pathogenic bacteria; protein targeting; genetics of antibiotic production.

Edward H. Coe Jr., professor of agronomy, PhD, University of Illinois. Maize genetics.

Larry Darrah, adjunct professor of agronomy, PhD, Iowa State University. Breeding maize for agronomic traits; quantitative genetics.

David W. Emerich, professor of biochemistry, PhD, University of Wisconsin-Madison. Symbiotic nitrogen fixation.

William R. Folk, chair and professor of biochemistry, PhD, Stanford University. Gene expression in plants and animals.

Thomas J. Guilfoyle, professor of biochemistry, PhD, University of Illinois. RNA polymerase; hormone-regulated gene expression; *in vitro* transcription.

J. Perry Gustafson, professor of agronomy, PhD, University of California-Davis. Manipulation of alien genes and their expression in cereals.

Robert W. Hoffman, professor of pathology, DO, Chicago College of Osteopathic Medicine. Autoimmunity; major histocompatibility complex; T cell receptor; cytokine genes.

Kathleen J. Newton, professor of biological sciences, PhD, Indiana University. Plant mitochondrial genetics.

David J. Pintel, professor of molecular microbiology and immunology, PhD, University of Illinois Medical School. Molecular virology; eukaryotic gene expression; DNA replication.

Joseph C. Polacco, professor of biochemistry, PhD, Duke University. Molecular genetics of nitrogen assimilation in plants and plant-microbe interaction.

R. Michael Roberts, Curators' professor of animal sciences, DPhil, Oxford University. Maternal-embryo interactions in early pregnancy.

David A. Sleper, professor of agronomy, PhD, University of Wisconsin-Madison. Breeding and genetics of tall fescue and soybean.

John C. Walker, professor of biological sciences, PhD, University of Georgia. Plant molecular biology.

Prakash R. Arelli, research associate professor of agronomy, PhD, University of Georgia. Genetics of resistance in soybean germ to *Heterodera glycines.*

Karen L. Bennett, associate professor of molecular microbiology and immunology, PhD, State University of New York-Buffalo. Developmental biology of nematodes; germ line determination.

John F. Cannon, associate professor of molecular microbiology and immunology, PhD, University of Wisconsin-Madison. Yeast genetics; RAS oncogene; protein phosphorylation.

Karen C. Cone, associate professor of biological sciences, PhD, Duke University. Maize molecular genetics; gene regulation.

David J. Eide, associate professor of food science and human nutrition/biochemistry, PhD, University of Wisconsin-Madison. Mechanism and regulation of transition metal metabolism in fungi, plants, and animals.

Miriam W. Golomb, associate professor of biological sciences, PhD, University of California-Berkeley. Eukaryotic cell regulation; molecular genetics; biochemistry of transcription.

Gretchen Hagen, research associate professor of biochemistry, PhD, University of Georgia. Plant molecular biology; control of gene expression by plant hormones.

Mark Hannink, associate professor of biochemistry, PhD, University of California-San Diego. Mechanisms of oncogenic transformation by retroviral oncogenes, transcription factors, and gene regulation.

Lené J. Holland, associate professor of physiology, PhD, University of California-San Francisco. Regulation of gene expression by steroid hormones.

Timothy P. Holtsford, associate professor of biological sciences, PhD, University of California-Riverside. Evolutionary genetics of natural plant populations.

Tim Hui-Ming Huang, associate professor of pathology, PhD, University of California-Davis. Molecular cytogenetics; human genome mapping.

Gary S. Johnson, associate professor, veterinary pathobiology, DVM, PhD, Kansas State University. Inherited diseases of man and domestic animals. Genetic risk factors for diabetic complications and cardiovascular diseases.

Martin L. Katz, research associate professor of ophthalmology, PhD, University of California-Santa Cruz. Role of protein modification in lipofuscin formation; role of lysine methylation in ceroid-lipofuscinosis.

Hari B. Krishnan, research associate professor of plant pathology, PhD, Washington State University. *Rhizobium*-legume interactions; cereal seed storage proteins.

David R. Lee, associate professor of molecular microbiology and immunology, PhD, University of Virginia. Major histocompatibility complex class I gene; gene evolution and organization; role of antigen presentation in the cell-surface expression of MHC class I molecules.

Dennis B. Lubahn, associate professor of biochemistry/child health, PhD, Duke University. Biochemical genetics of estrogen and androgen steroid receptors and trinucleotide repeat genetic diseases.

Bruce A. McClure, associate professor of biochemistry, PhD, University of Minnesota. Self-incompatibility in solanaceous plants.

Michael D. McMullen, associate professor of agronomy, PhD, University of Chicago. Genetic and molecular basis of plant responses to biological stresses.

Lela K. Riley, associate professor of veterinary pathobiology, PhD, University of Kansas. Pathogenesis of bacterial and viral infections and molecular diagnostics.

James E. Schoelz, associate professor of plant pathology, PhD, University of Kentucky. Host specificity of plant viruses.

Raymond D. Semlitsch, associate professor of biological sciences, PhD, University of Georgia. Life history evolution in amphibians.

Guri S. Johal, assistant professor of agronomy, PhD, Simon Fraser University. Disease resistance genes; disease-lesion mimicing mutations in maize; gene cloning by transposon tagging in maize.

Mannie Liscum, assistant professor of biological sciences, PhD, Ohio State University. Analysis of light-regulated development in higher plants.

Mark E. Martin, assistant professor of biochemistry, PhD, University of Mississippi Medical Center. Developmental regulation of transcription factors.

Steven F. Nothwehr, assistant professor of biological sciences, PhD, Washington University School of Medicine. Membrane protein sorting in the secretory pathway of yeast.

Charlotte L. Phillips, assistant professor of biochemistry/child health, PhD, North Carolina State University. Investigation of the structure and function of the extracellular matrix and the pathogenesis of inherited connective tissue diseases.

Ching H. Wang, assistant professor of psychiatry and neurology/biochemistry, PhD, MD, Northwestern. Molecular genetics of human neuromuscular and neuropsychiatric diseases.

Guang-Quan Zhao, assistant professor, veterinary pathobiology, PhD, University of Texas. BMPS and their signal transduction in mammalian germ cell development and differentiation; Transgenic mice and targeted mutagenesis.

INTERDISCIPLINARY AREA PROGRAM: PhD in genetics area

The Genetics Area Program prepares graduates for teaching and research careers in genetics. The curriculum provides broad, individual training tailored to the career objectives of the student.

Considerations for admittance:

- bachelor's degree with a GPA of B or higher during the last two undergraduate years,
- preparation in the sciences,
- GRE scores (combined verbal, quantitative and analytical scores should be 1800 or higher),
- letters of recommendation, and
- research experience.

A complete application consists of:

- application form,
- official transcripts,
- three letters of recommendation,
- GRE scores (general test required; advanced test in biology or biochemistry strongly recommended),
- TOEFL scores, if applicable (550 minimum), and
- graduate or international application and fee.

Applicants are expected to have:

- a broad background in biology,
- an introductory course in genetics, and
- one or more courses in each of the following: organic chemistry, biochemistry, mathematics (calculus and statistics), and physics.

Deficiencies in these subjects can be remedied after admission. Research experience is highly desirable.

Application should be made to the Director of Graduate Studies, Genetics Area Program. Application deadline is the first working day of February.

Minimum requirements for the PhD degree are:

- advanced courses in genetics, biochemistry and molecular biology,
- regular participation in the genetics area seminar program,
- successful completion of a comprehensive examination,
- at least one semester of teaching in a genetics course,
- three seminar presentations, and
- research, dissertation and oral defense.

These are beyond the Graduate School's requirements. Others are determined in consultation between the student and faculty advisory committee.

Geography

College of Arts and Science
8 Stewart Hall (573) 882-8370

FACULTY

Christopher L. Salter, chair, professor, PhD, University of California-Berkeley. Cultural geography; China; landscape analysis; geography education.

Joseph J. Hobbs, director of graduate studies, professor, PhD, University of Texas-Austin. Middle East; environmental geography; field methods.

Walter A. Schroeder, director of undergraduate studies, assistant professor, MA, University of Chicago. Historical geography; physical geography; Missouri regional geography.

Gail S. Ludwig, associate professor, DA, Northern Colorado University. Educational technology; geography education.

Edward L. Kinman, assistant professor, PhD, University of Minnesota. Geographic information systems, automated cartography, medical geography, South America.

James D. Hipple, assistant professor, PhD, University of Utah. Urban geography; spatial analysis; remote sensing.

Michael A. Urban, assistant professor, PhD, University of Illinois, Urbana-Champaign. Fluvial geomorphology; anthropogenic landscape change; environmental ethics.

Tim Haithcoat, instructor, MA, University of Missouri-Columbia. GIS, applied GIS.

Larry Brown, instructor, MA, University of Missouri-Columbia. Cultural, regional, political geography.

DEGREE: MA in geography

The Department of Geography offers two plans leading to the master of arts degree: a thesis and a non-thesis option. The non-thesis option requires the completion of a research program. Both options require 32 hours of graduate credit and prepare students for careers in applied geography, resource and environmental management, cartography, remote sensing, intelligence, and for teaching at the high school, community college and college levels. The MA also prepares students for doctoral work in geography at other universities.

The department emphasizes close contact between staff and graduate students. Individualized graduate programs allow latitude in areas of specialization such as regional, cultural and medical geography, cartographic design, Geographic Information Systems (GIS), applied geography, environmental studies, and geographic education. Strong collateral course work in such fields as anthropology, soil and atmospheric science, computer science, economics, geology, political science, forestry, resource management and history meets the special interests of many graduate students.

The faculty are occupied in an active program of research and field work in the Middle East, South America, Latin America and North America, in conjunction with systematic geography. They pride themselves on a creative instructional and interdisciplinary pattern of activity.

An exceptional departmental collection of reference materials, including maps, journals, and books, is available to graduate students in the department's Wheeler Library and Seminar Room. The holdings of Ellis Library in geography and related fields are extensive and MU's computer facilities are readily available. In addition, the department is home to the University's Geographic Resources Center (GRC). This facility serves as an interdisciplinary center for GIS, remote sensing, automated cartography, and computer graphics. Combined with associated courses in geography, this center provides a strong setting for instruction and research, and currently provides eight to ten annual research assistantships.

Awarded on a competitive basis, a total of approximately 10-15 graduate teaching and research assistantships are available annually. Applicants desiring consideration for one of these positions should indicate this in their applications to the department.

Geography

Applicants for the master of arts program with an undergraduate GPA of at least 3.0 (A=4.0) during the last two years of undergraduate work at MU may be admitted based on this record alone. Certain circumstances may qualify some applicants with lower GPAs to be admitted on probation. All applicants must complete a departmental application form and submit three letters of recommendation. All applicants must submit GRE scores to the department as part of their application.

For additional information write the Director of Graduate Studies in Geography, 8 Stewart Hall, Columbia, MO 65211.

MASTER'S DEGREE: Preparation for graduate work in geography should include courses in geography. Upon consultation with their advisers, students with insufficient work in geography may be required to take additional undergraduate courses.

The master of arts degree requires completion of 32 semester hours of course work. Eight hours may be thesis research for the students taking a thesis option. Fifteen or more of the 32 hours must be in courses at the 400 level. Every student must take Geography 405 and Geography 408. Every student must take 6 hours of seminar-structured course work in geography in addition to Geography 405 and Geography 408. Every student must take 6 hours of course work in geographic methods in the mapping sciences or in statistics. A student's specific program of courses is selected jointly by the student and the adviser, designated during the first semester in residence. All candidates who do not write a thesis must write at least one formal research paper and pass a comprehensive oral examination at the end of their graduate work. Students taking the thesis option must defend the thesis. Students who are planning to go on for the doctorate in geography are strongly encouraged to choose the MA thesis plan.

COURSES

210—Economic Geography (3). Geographical location and organization of world's major economic activities. Emphasizes agricultural and industrial patterns, commodity flows, transport networks, geographical principles of market and industrial location, internal spatial organization of cities, land-use models, geographic aspects of economics growth.

247—Introduction to Geographic Information (3). Introduction to methods of organizing and interpreting spatial information, including remote sensing, Geographic Information Systems and computer cartography. Prerequisites: 137 or equivalent map reading skills.

273—Geography of East Asia (3). Cultural, physical and economic geography of China, Japan, and Korea, with emphasis on China. Landscape analysis, determination of regional identities, and study of political forces evident in the development of the contemporary scene are stressed. Prerequisite: Geography 2.

275—Geography of the Middle East (3). Cultural, physical and historical geography of Middle East, with emphasis on cultural adaptations to environments and conflicts over the resources. Prerequisite: Geography 2 or equivalent.

280—Internship in Applied Geography and Cartography (1-3). Regularized individual work experience with local, regional, state or national agencies, with guidance and readings supplied by faculty coordinator. May repeat to maximum of 6 hours. Prerequisites: upper-level standing in Geography, Cartographic Training, and departmental consent.

296—Honors (3). Special work for Honors candidates in geography. f.

297—Honors (3). Special work for Honors candidates in geography. w.

299—Senior Seminar in Geography (3). A seminar in selected themes in Geography. Class will focus on research, writing, presenting, and discussing themes in contemporary geography. Required of all majors prior to graduation. Prerequisite: 5 courses in geography or instructor's consent.

300—Special Problems (1-3). Independent investigation leading to a paper or project. May be repeated to a maximum of 6 hours. Prerequisite: instructor's consent.

301—Topics in Geography (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing and instructor's consent; departmental consent for repetition.

303—Meteorology of the Biosphere (3). (same as Atmospheric Science 303).

304—Spatial Analysis in Geography (3). Application of statistical methods to geographic research. Prepares students to utilize advanced methodologies and models in spatial analysis. Includes computer analysis of geographical data. Prerequisite: Mathematics 10.

305—Selected Themes in Cultural Geography (3). Case studies in the patterns and processes of human—enviromental interactions. Study of the cultural forces responsible for the continual transformation of the earth's cultural landscapes. Prerequisite: 105 or instructor's consent.

311—Physical Geography of the United States (3). Study of natural regions of the United States by integrating topics from landforms, geology, climate, soils, vegetation, resources, and land use. Prerequisites: 111 and junior standing, or instructor's consent.

317—Historical Geography of North America (3). Analysis of selected geographical patterns and themes in the continent's past. Focus is explicitly geographical, stressing extensive use of maps and recent scholarly work by historical geographers. Prerequisites: 1 or 116, and junior standing, or instructor's consent.

320—Seminar in Geography Education (3). Study and research on fundamental themes in geography. Integration of these themes into regional and systematic approaches to the teaching of geography. Enrollment is restricted to students pursuing or considering careers in teaching. Prerequisites: junior standing and instructor's consent.

325—Urban Geography (3). Study of cities: origin, development, distribution, social economic, and demographic significance. Consideration of theories of structure, urban hierarchies, and land use planning. Prerequisites: 1, 2, and two other Geography courses, or instructor's consent.

337—Cartography (3). Principles and methods of map-design and manual construction of maps. Introduction to map projections. Prerequisites: 3 courses in Geography or instructor's consent.

338—Statistical Mapping (3). Mapping statistical data: problems, techniques, symbolization, and map comparisons. Frequency distributions and statistical measures as related to cartographic decisions and displays. Graphic display and cartographic displays. Prerequisites: upper-level or graduate standing; Statistics 207. 207.

340—Mexico, Central America, and the Caribbean (3). Physical environment and culture in the regional development of Mexico, Central America, and the Caribbean. Prerequisite: one course in Geography or instructor's consent.

341—South America (3). Physical environment and culture in the regional development of South America. Prerequisite: one course in Geography or instructor's consent.

344—Computer-Assisted Cartography (3). Principles of computer-assisted cartography. Automated cartographic display. "Hands on" experience with computer-mapping software and hardware systems. Role of computers in map design. Digital encoding of geographic data. Prerequisite: 137 or 247.

345—Remote Sensing (3). Introduction to the principles of remote sensing of the environment. Digital imagery from spacecraft, conventional and high-altitude aerial photography, thermal imaging, and microwave remote sensing. Prerequisite: 137 or 247.

347—Geographic Information Systems I (3). Introduces concepts of computer analysis of geographic data and emphasizes the techniques for handling geographic data. Application of computer-based GIS systems in coursework. Prerequisite: Geography 344.

350—Special Readings (1-3). Independent readings selected in consultation with supervisory faculty member. May be repeated to a maximum of 6 hours. Prerequisite: instructor's consent.

352—Geography of Africa (3). Major concepts of African geography in current and historical perspective. Prerequisite: one course in Geography or instructor's consent.

366—Climates of the World (3). (same as Atmospheric Science 366).

371—Southeast Asia (3). (same as South Asia Studies 371). Physical, cultural, historical and regional geography of Southeast Asia, with an introduction to East Asian geography. Emphasizes the problems of tradition and development. Prerequisite: 171 or junior standing.

372—Geography of South Asia (3). (same as South Asia Studies 372). Topical and regional analysis of India, Pakistan, Sri Lanka. Historical development of distinctive cultural regions. Relations with neighboring areas. Impact of Westernization on economic activities, settlements, population. Prerequisite: junior standing.

380—Selected Themes in Political Geography (3). Study of basic writing, dominant geographers, case studies, bibliographies and development of research methods. Prerequisites: 180 and three other geography courses, or instructor's consent.

396—Geography of Russia and the Newly Independent States of Eurasia (3). Geographic analysis of social, economic and political issues confronting Russia and the NIS, including environmental problems, economic interdependence and prospects for regional economic development, population change and migration, inter-ethnic relations and ethno-territorial conflict. Prerequisite: junior standing and one course in geography or a major in Russian Area Studies or instructor's consent.

400—Special Investigations (1-3). Advanced studies to meet the needs of the individual student. May be repeated to a maximum of 6 hours. Prerequisite: instructor's consent.

402—Field Geography (3). Techniques of geographical investigation in the field. Prerequisites: Geography 1,2 and four other courses in geography, or instructor's consent.

406—Seminar in World Regional Geography I (1). Problems in the teaching of world regional geography on college level. f.

407—Seminar in World Regional Geography II (1). Continuation of course 406. w.

408—American Approaches to Geography (3). Directions and stages in the development of American geographic thought. Course is built around landmark writings by American geographers. Prerequisite: graduate standing in Geography or instructor's consent.

410—Seminar (1-3). May be repeated to a maximum of 6 hours. Prerequisite: departmental consent.

425—Advanced Economic Geography (3). Examination of location theory and regional planning/development, with special reference to the British, German and Swedish schools of geography. Prerequisite: graduate standing.

439—Digital Image Processing for Spatial Analysis (3). Resource management techniques for processing digital imagery acquired by land resource satellites; emphasis on

classification and mapping of agricultural land uses and wildlife habitats. Prerequisite: Geography 345

445—Applied Remote Sensing (3). Analysis of remotely sensed data for resource management application. Acquisition of data, project planning, hands-on image interpretation experience, design of output products and project report preparation. Prerequisite: 345 or instructor's consent.

447—Geographic Information Systems II (3). Advanced study and application of Geographic Information Systems technology to natural resources planning. Focus on individual research projects. Prerequisite: 347 or instructor's consent.

450—Research (1-6). Research not leading to thesis. May be repeated to a maximum of 6 hours. Prerequisite: instructor's consent.

475—Seminar in the Geography of the Middle East (3). Advanced readings and analysis of topics in the geography of the Middle East. Prerequisite: graduate standing.

490—Research (1-8). Research leading to a thesis. May be repeated to a maximum of 8 hours. Prerequisite: instructor's consent. Graded on a S/U basis only.

Geological Sciences

College of Arts and Science
101 Geological Sciences Building
(573) 882-6785

FACULTY

Glen R. Himmelberg, chair, professor, PhD, University of Minnesota. Metamorphic petrology.

James H. Stitt, director of graduate studies, professor, PhD, University of Texas. Invertebrate paleontology.

Raymond L. Ethington, professor, PhD, University of Iowa. Micropaleontology and stratigraphy.

Thomas J. Freeman, professor, PhD, University of Texas. Carbonate sedimentology.

Peter Nabelek, professor, PhD, State University of New York-Stony Brook. Petrology and geochemistry.

Kevin Shelton, professor, PhD, Yale University. Economic geology and isotope geochemistry.

Michael B. Underwood, professor, PhD, Cornell University. Marine sedimentation and tectonics.

Robert L. Bauer, associate professor, PhD, University of Minnesota. Structural geology and metamorphic petrology.

Joseph Engeln, associate professor, PhD, Northwestern University. Earthquake seismology and plate tectonics.

Mian Liu, associate professor, PhD, University of Arizona. Geophysics and geodynamics.

Cheryl A. Kelley, assistant professor, PhD, University of North Carolina. Biochemistry.

Timothy W. Lyons, assistant professor, PhD, Yale University. Low temperature geochemistry.

Kenneth A. MacLeod, assistant professor, PhD, University of Washington. Paleontology and biogeochemistry.

Carol Wicks, assistant professor, PhD, University of Virginia. Hydrology and environmental geochemistry.

Chuanlun Zhang, assistant professor, PhD, Texas A&M University. Geomicrobiology and ground water microbiology.

DEGREES: MS and PhD in geology

The areas of specialization are biogeochemistry carbonate petrology, clay mineralogy, sandstone petrology, geochemistry, geophysics, hydrogeology, igneous petrology, metamorphic petrology, micropaleontology, ore deposits, invertebrate paleontology, sedimentation, stratigraphy, structural geology, tectonics and geomicrobiology.

Adequate space and excellent facilities are available for research in the Geological Sciences Building, which also houses an excellent geology library. Modern and sophisticated equipment is available for supervised student use in many fields. The Geology Field Camp is in the Wind River Mountains near Lander, Wyoming.

Many scholarships, assistantships, fellowships and other sources of financial aid are available. For information and applications, write to the Director of Graduate Studies, 101 Geological Sciences Building, Columbia, MO 65211, or visit our web site at http://www.missouri.edu/~geolwww.

GRADUATE PROGRAMS: Preparation for a graduate degree in geology should include a minimum of 30 semester hours in geology, two semesters of college chemistry, two semesters of college physics, two semesters of college calculus and one semester of computer science. Students specializing in paleontology should have work in invertebrate zoology and genetics.

Students enrolled for graduate credit in any course are required to have shown proficiency, grade of B or better, in the listed prerequisite course or courses.

Every student applying to the graduate program in geology at MU must present scores for the general test of the GRE. Any student who intends to enter the program with a bachelor's degree in geology should, in addition, present a score for the geology subject test of the GRE. All international students whose native language is not English must submit a TOEFL score of 560 or higher as a prerequisite for admission.

COURSES

220—Geology of Missouri (3). The physical, historical, and environmental geology of Missouri are describe, discussed and interpreted. Prerequisite: 123 or 124. w,s.

221—Geology of Missouri - Laboratory (1). A field based and laboratory based course that uses standard geological techniques to interpret the rock record of Boone County and Missouri. Corequisite: 220. w,s.

225—Rocks & Rock-Forming Minerals: Identification, Occurence & Origin (4). Introduction to the classification, occurrence, and origin of rocks and rock forming minerals. Includes identification of minerals and rocks in hand specimen by their physical properties. Prerequisites: 1 or 10, Chemistry 31 or concurrently. f.

234—Mineralogy (5). Introduction to crystallography, crystal chemistry and crystal structures. Systematic study of mineral groups. Includes identification of Minerals by physical, chemical and optical properties. Prerequisite: Chemistry 31 or concurrently. f.

300—Problems (1-5). Prerequisite: instructor's consent. f,w.

301—Topics (1-99). Organized study of selected topics. Subject and earnable credit may vary. Prerequisites: junior standing or higher and instructor's consent, departmental consent for repetition.

303—Applied Geophysics (3). Introduction to the fundamentals of geophysical methods and their applications in geology, environmental studies, and exploration. Topics include seismic, gravity, magnetic, and electric methods. Prerequisite: Physics 22, Math 175 and Math 80 or instructor's consent. f.

304—Plate Tectonics (3). Formation, evolution, and structure of the earth. Rules, causes, and implications of plate tectonics with emphasis on present-day features. Prerequisites: Geology 234, Physics 21 or 175, Math 80.

307—Structural Geology (4). The mechanical behavior of earth materials. Analysis of the geometry and mechanics of faults, fractures, and folds. Laboratory includes problems on stresses and strains associated with deformation, geometric analysis of deformation structures, and interpretation of geologic maps. Prerequisites: 1 or 10, Mathematics 80 or 108 or instructor's consent. w.

308—Sedimentary Environments and Facies (3). Mechanics of sediment transport, development of stratification and sedimentary structures, characteristics of non-marine, marginal-marine, and deep-marine depositional environments. Laboratory emphasizes description and classification of hand samples and thin sections. Prerequisite: 234. f.

310—Thermal Processes in the Solid Earth (3). Principles of heat transfer in solid earth by conduction, advection and convection. Basic analytic and numerical solutions. Application in Earth's dynamic system, environmental sciences, and geological problems. Prerequisites: Math 175, Physics 22 or 175.

320—Engineering Geology (3). Fundamentals of earth materials and geological processes and their applications in engineering works and environmental sciences. Includes properties of minerals and rocks, rock and soil mechanics, surficial geological processes, and practice of engineering. Prerequisite: 1 or 10; Math 80 or instructor's consent.

324—Karst Hydrology (3). Study of the mechanisms of groundwater flow in Karst terrains. Emphasizing several scales including that of a conduit, a catchment, and regional framework. Prerequisite: 1 or 10, Math 175, Physics 21 or 175. w.

325—Hydrogeology (3). Analysis of geologic factors related to occurrence, distribution, recovery and use of ground water. Prerequisites: Mathematics 80 or 108, Physics 21 or 175, 1 course in Geological Sciences.

326—Igneous and Metamorphic Petrology (3-4). Basic understanding of igneous and metamorphic rock associations and rock-forming processes. Emphasis on understanding the evolution of the Earth in view of igneous and metamorphic rock petrogenesis. Prerequisite: 234. w

331—Introduction to Paleontology (4). Study of the morphology, paleontology, patterns of evolution, and causes of extinction in geologically important groups of invertebrate and vertebrate fossils. Lab concentrates on identification of biostratigraphically important fossils (mostly invertebrates). Several half-day field trips. Prerequisites: 1 or 10 and upper-level standing or instructor's consent. f.

333—Water-Rock Interactions (1). Seminar and discussion of selected readings in the area of chemical hydrogeology. Graded on a S/U basis only. f.

335—Investigation of Earth Materials (3).

336—Field Course (6). Field study of sedimentary,igneous and metamorphic rocks. Facies analysis of sedimentary rocks, mapping of folded and faulted sedimentary strata and fabric analysis of an igneous-metamorphic terrane. Excursion to Yellowstone and Grand Teton National Parks. Prerequisites: 124, 307, 308.

340—Economic Geology (4). Geochemistry of ore deposits. Introduction to types of mineral deposits, genesis of ore, and current areas of research. Laboratory emphasizes hand-specimen and polished-section studies of a wide variety of ore deposit types. Prerequisites: 326 or instructor's consent.

342—Introduction to Low-Temperature Geochemistry (3). Introduction to the chemical alteration of rock-forming minerals in weathering environments and to factors controlling the chemical composition of subsurface water. Prerequisite: Chemistry 33.

344—Geomicrobiology and Microbial Biogeochemistry (3). Roles of microbes in a variety of geological settings through time. Microbial roles in degradation of organic pollutants and transformation of toxic metals and radionuclides in contaminated environments. Prerequisite: 234 or instructor's consent.

346—Groundwater and Subsurface Geomicrobiology (3). Distribution of microorganisms in subsurface environments and the effects of microbial activity on groundwater chemistry. In situ bioremediation of contaminated aquifers by subsurface microorganisms. Prerequisite: 234 or instructor's consent.

351—Organic Geochemistry (3). Topics include chemistry of petroleum-forming reactions and their kinetic parameters; use of organic-chemical criteria in source-rock evaluation; carbon isotope fractionation in organic precursors of biological molecules; early history of earth's atmosphere. Prerequisite: instructor's consent.

353—Seismic/Sequence Stratigraphy (3). Concepts and techniques of seismic and sequence stratigraphy and the origin of sequences and sequence boundaries. Includes lectures, workshops, and demonstrations utilizing seismic reflection profiles, borehole and outcrop data. Prerequisite: Sedimentology 308. f.

355—Theoretical Geochemistry (3). Introduction to theoretical concepts in low and high temperature geochemistry. Topics include thermodynamics of fluids, gases and solids in geological materials, phase diagrams, equilibrium constants, electrolyte theory, oxidation-reduction reactions. Prerequisites: Geology 234, Chemistry 33, and Mathematics 175. w.

370—Microcomputer Applications in Geology (1-3). Introduction to operating systems, programming languages, software and possible hardware configurations on popular microcomputers. Applications in the collection, management and analysis of geological data on such systems. Prerequisites: senior/graduate in Geology. f.

380—Marine Geology (3). Comprehensive examination of the geology of the oceans. Topics includes techniques of data collection and interpretation, physical oceanography, origin of marine sediments, marine tectonics, and ocean history. Prerequisites: 308, Chemistry 33, and Physics 22. w, alt. years.

388—Petroleum Geology (3). Processes of petroleum generation, migration, and accumulation; characterization of source and reservoir rocks; distribution of petroleum, with emphasis on tectonic setting and basin types. Lab stresses introduction to, and application of exploration techniques. Prerequisites: 124, 234, and 308.

390—X-ray Mineralogy (3). Introduction to X-ray crystallography and crystal structure determination. Theory and application in lab of x-ray diffraction in study of minerals. Emphasis on determination of compositional variation in mineral groups. Prerequisite: 234.

395—Introduction to Seismology (4). Principles of wave propagation in layered elastic media. Applications of digital signal processing to seismological problems. Emphasis on theoretical basis behind modern analysis techniques. Prerequisites: Physics 176, Mathematics 309, Computer Science 103, and an Introductory Geology course or instructor's consent. w.

396—Earthquake Seismology (3). Theory and techniques used in analyzing earthquake seismograms and seismicity data. Ray theory and phase identification for the whole earth. Epicenter determination. Frequency-magnitude relationships. Earthquake source mechanisms and parameters. Prerequisites: 395 or instructor's consent.

399—Senior Thesis (1-3). Research conducted in an area of the Geological Sciences under the auspices of a member of the faculty. Under normal circumstances, this research should be completed over two semesters. May be repeated for a maximum of 3 hours credit. Prerequisites: senior standing, geological sciences majors, instructor's consent. f,w,s.

400—Problems (1-8). Prerequisites: graduate standing & instructor's consent. f,w,s.

402—Continental Tectonics (3). The structural, metamorphic, and igneous evolution of mountain belts and continental rifts with emphasis on convergent margin settings and terrane accretion processes and products. Case studies are considered from the Precambrian to the recent. Prerequisites: 307 and 326.

404—Advanced Structural Geology (3). Advanced analysis of deformation structures in rocks. Theory and techniques of stress and strain analysis and their application to the mechanics of formation of faults, folds, shear zones, and rock fabric. Techniques of multideformation structural analysis. Prerequisite: 307. f.

407—Precambrian Geology (3). Examination of the petrology, structural geology, and geochemistry of the Precambrian rock record. Emphasis on the tectonic and historical evolution of continental crust. Examples from shield areas of the world. Prerequisites: 307, 326. f.

409—Marine Chemistry (3). Survey of biogeochemical processes in shallow and deep marine settings. Topics include sediment diagenesis, geochemical tracers, nutrient patterns and pathways, global biogeochemical cycles, paleoceanographic proxy records, and integrated paleoenvironmental reconstructions of ancient marine sequences. Prerequisite: 342 or instructor's consent. f.

411—Tectonics and Sedimentation (3). Global survey of modern and ancient convergent plate boundaries with an emphasis on sedimentary facies and structural styles. Prerequisites: 307, 308 and instructor's consent. w. alt. years.

413—Seminar in Solid-Earth Geophysics (2). Prerequisites: 303 or equivalent and instructor's consent.

414—Stable Isotope Geochemistry (3). Mechanisms and fundamental concepts of fractionation of light stable isotopes in nature. Emphasizes application of hydrogen, carbon, oxygen and sulfur isotopes to igneous, metamorphic and sedimentary rocks, metallic ore deposits, and to natural waters. Prerequisites: Instructor's consent.

419—Carbonate Petrology (3). Petrography and petrology of ancient carbonates in the light of recent analogues. Prerequisite: Geology 308. f.

420—Sandstone Petrology (3). Texture, composition and petrogenesis of sandstones. Quantitative analysis of petrographic data. Lecture and lab equally stressed. Prerequisites: 308 and 456.

423—Electron Beam X-ray Microanalysis (2). Theories and techniques in qualitative and quantitative x-ray microanalysis with electron beam systems. Prerequisite: 456.

424—Stratigraphy (3). Principles, methods, and nomenclature. Regional studies of sediments. Prerequisites: 124, upper-level or graduate standing. w.

426—Metamorphic Petrology (3). Petrography and petrology of metamorphic rocks. Emphasis on textures, mineral assemblages, and mineral chemistry in order to determine the physico-chemical condition of metamorphism. Prerequisites: 235, 326.

427—Igneous Petrology (3). Studies of the origin and evolution of magmas with use of phase equilibria, physical properties, and kinetics. Prerequisites: 235, 326 or instructor's consent. f.

428—Radiogenic Isotope Geochemistry (3). Studies of the application of trace element and radiogenic isotope systematics to petrogenesis of rocks. Prerequisites: 326 or instructor's consent. f.

432—Introduction to Micropaleontology (3). Introductory work on microfossils. Prerequisite: 331. f.

433—Advanced Paleontology (3). Principles of taxonomy, biostratigraphy, functional morphology and paleoecology are illustrated by individual projects that combine field collecting, laboratory examination and literature research. Prerequisite: 331 or instructor's consent.

443—Advanced Aqueous Geochemistry (3). Study of mineral-water interface geochemistry. Course will cover dissolution and precipitation kinetics, sorption reactions, and current theories. Prerequisites: 342 or Agronomy 319.

445—Mineralogy and Petrology of Clays (3). Structure and chemistry of clay minerals and related silicates. Unique surface properties of colloidal clays. Diagenesis and catagenesis of shales and claystones. Clay mineral catalysis in natural clay systems. Prerequisite: instructor's consent.

450—Research (1-8). Does not lead to dissertation.

451—Advanced Hydrogeology (4). Quantitative evolution of the flow and transport of contaminants in geologic media. Prerequisites: 325 or instructor's consent.

456—Scanning Electron Microscopy (2). Principles and practices of SEM analysis in geological and materials characterization applications. Prerequisite: instructor's consent. f.

460—Bioremediation Strategies (3). Discussion of contaminant degradation pathways and current technology available. The interdisciplinary aspects of the field will be emphasized. Prerequisite: instructor's permission.

490—Research (1-99). Preparation of dissertation. Graded on a S/U basis only.

German and Russian Studies

College of Arts and Science
451 General Classroom Building (573) 882-4328

GERMAN FACULTY

Dennis M. Mueller, professor of German, PhD, Washington University.

Roger Cook, associate professor of German, PhD, University of California-Berkeley.

Carsten Strathausen, assistant professor of German, PhD, University of Oregon.

RUSSIAN FACULTY

Gennady Barabtarlo, chairman, professor of Russian, PhD, University of Illinois.

Elisabeth Krimmer, assistant professor of German, PhD, University of Massachusetts.

Timothy Langen, assistant professor of Russian, PhD, Northwestern University.

DEGREE: MA in German

The program prepares students for admission to PhD programs and for professional language careers in a number of fields. Courses in language, linguistics, literature, teaching techniques and skills, seminars in various specialized aspects of German studies, and directed study and research provide candidates with opportunities to acquire a comprehensive background in German.

Resources include extensive library holdings in Germanic literature and linguistics, periodical and book collections in methodology, and an electronically equipped audiovisual laboratory for language training.

Teaching assistants receive training in pedagogy.

Applicants to the graduate program must have an undergraduate degree from an accredited college or university or the equivalent, a GPA of B or higher on the last 60 hours of the undergraduate course of study and an undergraduate major in German or the equivalent. The department reserves the right to evaluate the work presented for admission and to determine

how the student may make up for background deficiencies.

Students must complete a minimum of 30 hours of graduate-level courses with a GPA of B or higher. No fewer than 24 hours are to be earned in German courses at the 300 or 400 level and at least 15 hours must be taken in German courses at the 400 level. A thesis, with a maximum of six hours of credit or a critical essay, with a maximum of three hours credit, is optional.

Courses taken outside the department must complement the student's program of study and require the approval of the departmental adviser. No language other than German is required.

Information regarding specific course requirements can be obtained by writing to the director of graduate studies.

Candidates for the MA degree must pass comprehensive written and oral final examinations based on course work and the departmental reading list.

COURSES

GERMAN

201—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated to a maximum of 6 hours with departmental consent. Prerequisites: sophomore standing and instructor's consent.

203—Advanced German Reading (3). Prerequisite: German 3 or equivalent.

206—German Conversation and Composition II (3). Prerequisite: German 106 or equivalent.

207—Intensive Beginning German (3). Designed to lead to a reading knowledge of German. Cannot be taken to fulfill undergraduate language requirement. Prerequisites: graduate standing or instructor's consent.

208—Business German (3). Conversation, composition and reading based on terminology used in business situations. Prerequisite: 106, 203 or equivalent

255—Readings in German Literature (3). Readings in English of selected works of German literature from Goethe to the present, with a particular emphasis on writers and texts that have had a strong influence on European thought and culture. Prerequisite: sophomore standing, English 20.

275—German Classics I (3). Reading and discussion of selected works by major German writers from 1740 to 1870. Prerequisite: German 203 or equivalent.

276—German Classics II (3). Reading and discussion of selected works by major German writers from 1870 to the present. Prerequisite: German 203 or equivalent.

296—Honors in German (1-3). Special problems in Germanic literature or linguistics. Prerequisite: consent of departmental Honors director.

301—Topics in German (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated to a maximum of 6 hours with departmental consent. Prerequisites: junior standing and instructor's consent.

306—German Conversation and Composition III (3). Prerequisite: German 206 or equivalent.

308—Enlightenment and Sturm und Drang (3). Survey of literature and thought of 18th-century Germany, with emphasis on the works of Lessing, Wieland, Herder and the younger Goethe. Prerequisite: German 275 or equivalent.

313—The German Novelle (3). Prerequisite: German 275 or equivalent.

315—Faust (3). Prerequisite: German 275 or equivalent.

333—German Drama from 1750 - 1850 (3). Study of one drama by Lessing, one by Goethe, two by Schiller, two by Kleist. Prerequisite: 275 or equivalent.

334—German Drama from 1840 - Present (3). Study of one drama by Buechner, one by Hebbel, one by Brecht, one by Durrenmatt, one by Hauptmann and two of the instructor's choosing. Prerequisite: 275 or equivalent.

350—Special Readings (1-3). Independent study through readings, conferences, and reports. Prerequisites: junior standing and chairman's consent.

351—German Romanticism (3). Prerequisite: German 275 or equivalent.

360—Recent German Literature (3). Prerequisite: German 275 or equivalent.

375—Medieval German Literature 1170-1210 (3). Analysis of major narrative and lyric poetry of the Age of Chivalry. Prerequisite: German 275 or equivalent.

381—Advanced Grammar, Syntax and Stylistics (3). Considers complicated grammatical and syntactical structures. Prerequisites: senior or graduate standing, or instructor's consent.

383—Internship in German (3). Supervised introduction to the methodology of the teaching of elementary German; conducted in a classroom environment. Prerequisites: junior standing, 275 or instructor's consent.

400—Problems (1-99). Prerequisites: graduate standing and chairman's consent.

401—Topics in German (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated to a maximum of 6 hours with departmental consent.

410—Seminar (3). Course content varies. Prerequisites: graduate standing or instructor's consent.

415—Reformation and Renaissance Literature (3). The course investigates significant works of German literature of the late 15th and 16th Centuries. Prerequisites: graduate standing or instructor's consent.

425—German Poetry from Sturm und Drang to 1848 (3). Reading of selected poetry by German writers of Sturm und Drang, Classicism, Romanticism, and Vomarz.

450—Research (1-99). Translations or creative work not leading to thesis. Credit hours arranged. Prerequisites: graduate standing or departmental consent.

460—History of the German Language (3). (same as Linguistics 460). Prerequisites: graduate standing or instructor's consent.

461—Middle High German (3). (same as Linguistics 461). Prerequisites: graduate standing or instructor's consent.

RUSSIAN

201—Topics in Russian (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: sophomore standing, departmental consent for repetition.

203—Intermediate Russian Reading (3). Prerequisites: 2 or equivalent or instructor's consent.

206—Intermediate Conversation and Composition (3). Further develops oral command of Russian as well as listening comprehension and some letter writing skills. Prerequisite: 106 and 203 or instructor's consent.

219—Russian and Soviet Cinema (3). Survey and analysis of select Soviet films. Emphasis on film-making as a form of art. English or subtitled. Second screenings by arr. Some films may run over 2 hrs. No foreign language credit. Prerequisite: junior standing or instructor's consent.

251—Heroes of Their Times: Individualism in Russian Literature (3). Examines selected works by the major Russian writers of the first half of the nineteenth century. Reading and lectures in English. Prerequisite: sophomore standing or instructor's consent.

252—Matters of Life and Death: The Fiction of Tolstoy and Dostoevsky (3). Analyzes the major works of Tolstoy and Dostoevsky. Readings and lectures in English. Prerequisite: sophomore standing or instructor's consent.

253—Decline, Fall, and Resurrection in Modern Russian Literature (3). Analysis of the major trends in Russian literature and related cultural developments from 1890 to 1930. Readings and lectures in English. Prerequisite: sophomore standing or instructor's consent.

254—The Split Tree of Russian Literature: Contemporary Russian Prose (3). Analyzes the divided tradition of Russian literature since 1930 in the works of such authors as Nabokov, Pasternak, Bulgakov, and Solzhenitsyn. Readings and lectures in English. Prerequisite: sophomore standing or instructor's consent.

275—Russian Classics I (3). Reading and discussion of selected works by major Russian writers of the nineteenth century. Course conducted in Russian. May be taken after Russian 276. Prerequisite: Russian 203.

276—Russian Classics II (3). Reading and discussion of selected works by major Russian writers of the twentieth century. Course conducted in Russian. May be taken after Russian 275. Prerequisite: Russian 203.

301—Topics in Russian (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing and instructor's consent, departmental consent for repetition.

306—Advanced Russian Conversation (3). Advanced Syntax, idiomatic constructions, and vocabulary building. Prerequisite: Russian 206 or equivalent.

311—The Russian Novel (3). Selected readings and seminar discussion of major novelists of the 19th and 20th centuries. Prerequisites: 203 and 275 or 276, equivalent.

315—Russian Poetry (3). Survey of readings in Russian poetry from its beginnings to present. Prerequisite: Russian 203 or equivalent.

316—Russian Drama (3). Selected readings in and discussions of major Russian plays of the nineteenth and twentieth century. Prerequisite: 203 or equivalent.

350—Special Readings (1-3). Prerequisites: junior standing & chairman's consent.

360—Russian Literary History (3). A study of the major works of Russian literature in relation to their representations in literary history. This is a capstone course that draws on knowledge acquired in previous or concurrent courses. Prerequisite: Russian major.

CHINESE

200—Problems: Chinese (1-3). Supervised study in Chinese language and/or culture. May be taken for a maximum of 6 credits. Prerequisite: instructor's consent.

255—Modern and Contemporary Chinese Fiction (in translation) (3). Studies Chinese fiction from 1920s to 1990s. Preceded by a brief historical survey of Chinese literature. Analyzes works by authors like Lu Xun, Ba Jin, Lau She, Wang Meng and many others of the younger generation. Readings and lectures in English. Prerequisite: sophomore standing.

JAPANESE

200—Problems: Japanese (1-3). Supervised study in Japanese language and/or culture. May be taken for a maximum of 6 credits. Prerequisite: instructor's consent.

206—Intermediate Japanese Composition and Conversation (3). Further develops oral command of Japanese as well as listening comprehension and some letter writing skills. Prerequisite: 106 or equivalent or instructor's consent.

255—Classical Japanese Literature (in translation) (3). This course studies Classical Japanese Literature preceded by a brief historical survey of Japanese literature. Analyzes such works as "Essays in Idleness" (Tsurezuregusa) by Yoshida Kenko in the 14th century and "Hojoki" by Kamona Chomei in the 13th century. Readings and lectures in English. Prerequisite: sophomore standing.

256—Modern Japanese Literature (3). Surveys Japanese literature from 1868 to present. Analyzes works by such authors as Soseki, Tanizaka, Kawabata, Akutagawa, Oe, Murakami, and others. Readings and lectures in English.

Prerequisite: sophomore standing.
275—Intermediate Readings in Japanese (3). Develops reading skills and acquisition of more Kanji. Prerequisite: Japanese 106 or equivalent or instructor's consent.

KOREAN

201—Topics (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: sophomore standing and instructor's consent; departmental consent for repetition.

Gerontology

229 Dockery-Folk Hall (573) 884-2261

A graduate interdisciplinary minor is available for both master's and doctoral degrees.
For information concerning curriculum offerings and participating faculty write or call David B. Oliver, 229 Dockery-Folk Hall, Columbia, MO 65211, (573) 884-2261.

Health Management and Informatics

School of Medicine
324 Clark Hall (573) 882-1849
http://www.hmi.missouri.edu

The Department of Health Management and Informatics offers a program in Health Services Management and a program in Health Informatics. The program in Health Services Management offers an MHA degree in both a residential format and an executive format. The program in Health Informatics offers an MS in Health Informatics and a federally funded Health Informatics Research Training fellowship program. In addition, the department provides international executive training through its International Health Management and Informatics Academy.

FACULTY

Gordon D. Brown, professor and chairman, PhD, University of Iowa. Managed care; organizational behavior and theory.
Paul Ahr, adjunct professor, PhD, The Catholic University of America. Human resources management.
L. Jerome Ashford, clinical professor, MPA, University of Southern California. Managed care, international health care.
E. Andrew Balas, associate professor, PhD, University of Utah, MD, Semmelweis University Medical School. Medical information systems.
Keith E. Boles, associate professor, PhD, University of Arizona. Health care finance.
Robert S. Bonney, adjunct professor, JD, Detroit College of Law; MHA, University of Missouri-Columbia. Health care systems.
Kenneth D. Bopp, clinical professor, PhD, University of Missouri-Columbia. Quality management, strategic planning, marketing.
Anna Florey, assistant professor, PhD, University of Texas. Organization behavior, human resources management, information systems.
Joseph W. Hales, assistant professor, PhD, University of Utah. Health informatics.
Lanis L. Hicks, associate professor, PhD, University of Missouri-Columbia. Health care economics.
J. Craig Klimczak, adjunct professor, DVM, Louisiana State University, MS, University of Missouri-Columbia. Medical information systems.
David B. Oliver, clinical professor, PhD, University of Missouri-Columbia. Managed care, long term care.
Timothy B. Patrick, clinical assistant professor, PhD, University of Missouri-Columbia. Health informatics.
Dinah K. Pearson, lecturer, MHA, University of Missouri-Columbia.
Gerald M. Sill, adjunct professor, JD, University of Missouri-Columbia. Health care law.
Eduardo Simoes, adjunct professor, MD, Universidade de Pernambuco; MPE, Emory University. Managerial epidemiology.
Tamara T. Stone, assistant professor, PhD, St. Louis University. Clinical process design and quality management.
David A. West, professor, PhD, University of Arkansas. Finance.

DEGREE: Master of Health Administration

JOINT DEGREES: The MHA can be jointly pursued with the following degree programs: MBA, MHA, MPA, MS in industrial engineering, MS in health informatics.

The basic MHA curriculum is designed for a range of educational backgrounds and provides the knowledge and skills necessary to function effectively as a health care executive. The program draws on many other academic areas within the University to provide a broad academic base. The curriculum includes the competency areas of quantitative analysis, financial management, health planning and marketing, organization, and development.

By combining basic and advanced course work with an internship and executive management study (an applied management study that replaces a thesis), the student may develop expertise in an area of emphasis. Course selection is a mutual decision between the student and adviser, and in all cases, the intent is to tailor the degree program to the student's interests.

The goal of the graduate program in health services management is to prepare professionals for leadership roles in health administration.

Students develop an excellent applied knowledge in such areas as clinical decision support systems, risk assessment and management, clinical outcomes assessment, managing interdisciplinary teams, and integrated health systems.

Initiated in 1965, the program is a member of the Association of University Programs in Health Administration (AUPHA) and has been accredited since 1968 by the Accrediting Commission on Education for Health Services Administration (ACEHSA).

DEGREE REQUIREMENTS: The MHA curriculum includes 12 hours of foundation coursework, 45 hours of health services management coursework, and six hours of professional electives. To graduate, a student must maintain a GPA of 3.0 (A=4.0) or better.

The foundation courses are:
- Financial Accounting (Accounting 36 or 310)
- Managerial Finance (Business Administration 344)
- Microeconomics (Economics 4)
- Statistical Analysis (Statistics 207)

ACADEMIC PROGRAM: In the first year, the graduate program develops the skills and conceptual and theoretical background necessary for analyzing complex health system problems and for thinking innovatively. After completion of the first two semesters, students serve a 12-week internship under the guidance of a qualified preceptor in an approved health care organization. This enables students to become familiar with the field, cognizant of the issues and problems in day-to-day operations, and become experienced in the application of the concepts and skills obtained during the first year of coursework. Clinical and field experience sites are provided by health care organizations throughout the country. During the internship, students generally are paid a monthly stipend. The second year builds on the conceptual and theoretical base of the first year, providing increased flexibility for concentration in various administrative and planning areas and allowing students to pursue more independent learning. Emphasis is placed on the development of an individual with the behavioral and decision-making skills necessary for a leadership position in a changing health care environment. In addition, all students are required to successfully complete an oral examination that enables faculty to evaluate the student's competency in health management. After the second year, the student may elect to serve an administrative fellowship of one year or more. Students often choose a fellowship to gain experience and broaden their orientation in large complex health institutions. If students lack previous work experience and want an extended learning opportunity under a preceptor, they may elect, or the faculty may recommend, that a fellowship be served.

EXECUTIVE MHA PROGRAM: In addition to the traditional degree program, an alternative format program is offered for health care professionals who have a minimum of five years of clinical or administrative experience in health care. Class sessions are held during the winter and fall semesters only, once a month (noon Thursday through noon Sunday).
For additional information about the Executive MHA Program, please call the Admissions Coordinator at (573) 882-1849, or visit the web site at http://www.hmi.missouri.edu.

ADMISSION REQUIREMENTS: The Health Services Management Program recruits and accepts qualified applicants regardless of race, sex, age, physical ability or national origin. To qualify for acceptance, an applicant must have earned a baccalaureate degree, maintained a 3.0 GPA during the last 60 hours of undergraduate course work, and have achieved acceptable scores on the RE general test (verbal and quantitative scores should total 1000 or more) or the GMAT (above 50th percentile). Students who wish to dually enroll in the MBA program should submit GMAT scores. Applicants from countries where English is not the native language are required to submit test scores of 550 or better from the TOEFL.
Application materials and additional informa-

tion about the program in Health Services Management are available by writing or calling the Graduate Admissions Coordinator in the Department of Health Management and Informatics, 324 Clark Hall, Columbia, MO, 65211, (573) 882-1849 or (573) 882-6178, or visit the web site at http://www.hmi.missouri.edu.

Program in Health Informatics

DEGREE: Master of Science in Health Informatics

JOINT DEGREES: The MS in Health Informatics can be jointly pursued with the following Master's Degrees: MHA, MPA , MS in industrial engineering , MBA .

MASTER OF SCIENCE IN HEALTH INFORMATICS: This multi-professional program within the School of Medicine is a specialized program with a computer science core. The program is designed to educate individuals in the theory and application of health information science in the context of integrated health delivery systems, with special emphasis on:

- Electronic health care record
- Information systems for managing care
- Telemedicine

The program has an applied orientation within a Health Sciences Center highly regarded for its advanced integrated information management system.

Students develop an excellent knowledge of health information applications and research at the organizational level in operational health care environments. The program provides specific emphasis on the synthesis, retrieval, organization, management, and communication of health information, as well as professional ethics and bioethics.

The curriculum includes coursework in information architecture and decision support, basic information technology, health care and health information systems, and information storage, retrieval and management. Coursework is combined with an internship and an applied research project (a project that replaces a thesis), allowing the student to develop expertise in an area of emphasis. Course selection is a mutual decision between the student and advisor, and in all cases, the intent is to tailor the degree program to the student's interests.

DEGREE REQUIREMENTS: The MS in Health Informatics curriculum includes 9 hours of foundation coursework in basic information technology, 39 hours of health informatics coursework, and six hours of professional electives. To graduate, a student must maintain a GPA of 3.0 (A=4.0) or better.

The basic information technology courses are:

- CECS 211 Production Languages
- CECS 338 Database Management Systems
- CECS 381 Computer Networks

ACADEMIC PROGRAM: In the first year, the graduate program develops the skills and conceptual and theoretical background necessary for analyzing complex problems in the design and management of health information system. After completion of the first two semesters, students serve a 12-week internship under the guidance of a qualified preceptor in an approved health care organization. This enables students to become familiar with the field, cognizant of the issues and problems in day-to-day operations, and experienced in the application of the concepts and skills obtained during the first year of coursework. Clinical and field experience sites are provided by health care organizations throughout the country. During the internship, students generally are paid a monthly stipend. The second year builds on the conceptual and theoretical base of the first year, providing increased flexibility for concentration in various information system design and development areas and allowing students to pursue more independent learning. In addition, all students are required to complete successfully an oral examination that enables faculty to evaluate the student's competency in health informatics.

ADMISSION REQUIREMENTS: The Health Informatics program recruits and accepts qualified applicants regardless of race, sex, age physical ability or national origin. To qualify for acceptance, an applicant must have earned a baccalaureate degree, maintained a 3.0 GPA during the last 60 hours of undergraduate course work and any subsequent graduate course work, and have achieved acceptable scores on the GRE general test (verbal and quantitative scores should total 1000 or more). Students who wish to dually enroll in the MBA program should submit GMAT scores. Applicants from countries where English is not the native language are required to submit test scores of 550 or better from the TOEFL.

Application materials and additional information about the program in Health Informatics are available by writing or calling the Graduate Admissions Coordinator in the Department of Health Management and Informatics, 324 Clark Hall, Columbia, MO, 65211, (573) 882-1849 or (573) 882-6178, or visit the web site at http://www.hmi.missouri.edu

COURSES IN HEALTH MANAGEMENT AND INFORMATICS

At press time, Health Informatics courses were still being developed. For the latest listing of all available courses, please call the Admissions Coordinator at (573) 882-1849, or visit the web site at http://www.hmi.missouri.edu.

210HM—The American Health Care System (3). Student is provided with a basic understanding of the major components (financing, planning, and regulating) of the American health care system. Emphasis is placed on current issues and their impact on the delivery system. cor.

215—Principles of Health Care Management (3). The course introduces the fundamental principles of management, emphasizing the practical application of these principles in a health care environment.

250HM—Health Planning Principles (3). Overview of health planning. Introduction to the theories, concepts and principles upon which the practice of planning is based and the context in which health planning is practiced in the United States.

260HM—Legal Aspects of Health Care (3). Studies the legal aspects and fundamentals of health care law. Addresses legal issues confronting and concerning health care providers in today's environment. Prerequisite: 210HM

289HM—Practicum (3-6). Supervised field experience in an approved health agency, institution or organization. Opportunity for observation and participation under guidance of a qualified preceptor. S/U graded only.

300—Problems (1-3). Directed exploration of health services management problems. Prerequisite: instructor's consent. cor.

310—The Health Care System (3). Overview of health care system and relationship between its components. Focuses on changing nature of the system and issues confronting the future health care system. Prerequisite: senior standing. f.

340HM—Economics of Health Care (3). Application of basic economic principles and concepts to the health care delivery system and to the analysis of public policies in health care. Prerequisite: Economics 51 or equivalent. Writing Intensive Course.

360—Management of Health Care Organizations (3). An integrative course which examines the organization, management, and current issues of a variety of health care organizations. Focuses on delivery of health care and the role of the professional manager. Prerequisites: 210 HM and 215 or Management 202.

400—Problems (1-3). Intensive study of an area of health services management. Prerequisites: graduate standing & instructor's consent.

410—Design of Health and Human Service Systems Evaluation (3). Explores the delivery of health services within alternative systems structures. The content of the course focuses on the design and performance of the functional areas of organizations within alternative structural configurations.

424—Public Health and Medical Care Economics (3). Building upon previous knowledge of basic economic theories, concepts, and tools, the structure, organization, activities, functions, and problems of health and medical care are considered from an economics perspective. Prerequisite: 410, microeconomics.

430—Design and Management of Health Information Systems (3). (Same as Veterinary Medicine & Surgery & Informational Sci 430) Examines clinical research and administrative application of the computer in health services delivery. Provides an introduction to medical informatics. Prerequisite: appropriate class in computer methods/application or instructor's consent.

450—Methods of Health Services Research (1-99). Writing intensive coruse provides students with basic understanding of literature search, experimental designs, evaluation methods, ethics, reporting and application of health services research. Practical research problems are discussed and students prepare a professional, managerially relevant research proposal.

460—Administration of Health Care Organizations (3). Analyzes health care organizations, emphasizing organizational structure, and strategy, and managerial leadership. Topics include governance, adaptation, design, interorganizational networks, and organizational performance. Prerequisites: 410, or instructor's consent. w.

461—Human Resources Management in Health Care Organizations (3). Examines the purposes, functions, and activities of personnel and human resources management in health care organizations. Prerequisites: HSM 410 and 460.

470—Strategic Planning & Marketing for Health Care Organizations (3). Analysis of strategic planning and services management and marketing concepts, techniques, and tools in the health care industry. Includes analyzing the environment, assessing the organization's strengths and weaknesses, formulating strategy to achieve competitive advantage, and implementing strategy through service management and marketing. Prerequisite: 410 or instructor's

consent.

471—Decision Support in Health Care Systems (3). Applies principles and techniques of computer-assisted decision making to solve health care problems. Clinical and managerial applications of artificial intelligence, including expert systems reviewed. Advantages of integrating decision support programs with databases are discussed. Prerequisites: 460, Statistics 207.

472—Financial Management for Health Care Organizations (3). Application of concepts, tools and techniques of financial management and their interrelationships as they apply to current and future operation of health care organizations. Prerequisites: 460, Business Administration 344 or instructor's consent. w.

473—Decision Making for Health Care Organizations (3). Applies and integrates marketing, operations, human resources, and financial management decision-making in health care organizations. Case studies, role playing exercises, simulations, and games are used to demonstrate the dynamic tension between operations efficiency and marketing effectiveness that characterizes decision-making directed toward achieving organizational financial integrity.

474—Health Care Law and Ethics (3). Provides background in the analysis of ethical problems and gives basic information on the function and methods of law as applied to health service delivery. Prerequisites: 410 or instructor's consent.

475—Contempory Issues in Health Care Policy (3). The historical development of temporary results in health care policy are critically analyzed in a seminar format. Prerequisites: HSM 410 and 424, or instructor's consent.

489—Field Experience in Health Services Management (1-99.9). Supervised field experience in approved health agencies and institutions. Opportunity for observation and service participation in various fields of health. Prerequisites: graduate standing & instructor's consent. Graded on a S/U basis only.

Historic Preservation Minor

109 Pickard Hall (573) 882-6711

FACULTY

Howard Wight Marshall, program director and committee chair, professor, PhD, Indiana University. American folk art and vernacular architecture.

Susan Flader, professor of history, PhD, Stanford University. Environmental history and history of the American West.

Osmund Overby, professor emeritus, PhD, Yale University. American architecture and art.

H. Clyde Wilson, professor emeritus of anthropology, PhD, University of California-Los Angeles. Cultural anthropology.

Ruth Brent, associate professor, environmental design, PhD, University of Minnesota. History of interior design.

Laurel Wilson, associate professor of textile and apparel management, PhD, University of North Carolina-Greensboro. Material culture and costume.

Walter Schroeder, assistant professor of geography, PhD, University of Missouri. Cultural geography.

DEGREE: interdisciplinary graduate minor in historic preservation and material culture studies.

As the catalog goes to press the structure of this program is being reevaluated.

The graduate minor in historic preservation gives students the opportunity to study this field and to prepare for careers in the public sector in a variety of related professions. This program, reflecting the strengths of the faculty at the University, stresses history and academic theory combined with practical field experience. Students in historic preservation, who are planning careers in historical museums, may find relevant curatorial and conservation courses in art and archaeology.

CURRICULUM: The program comprises at least 15 hours of approved course work. The required foundation course is Art History and Archaeology 375 or History 375 (Historic Preservation), an interdisciplinary survey of the history, theory and state of the discipline. Also recommended are AHA 264 (Traditional Architecture), AHA 364 (Material Folk Culture), AHA 365 (American Architecture) and AHA 374 (Historic Preservation Methods), or their equivalent. Other courses may be drawn from the fields of history, environmental design, geography, textile and apparel management, and anthropology. Students in historic preservation also are required to complete AHA 465 (a three-credit hour internship), or its equivalent. The course of study and the internship, planned to reflect the student's particular interests and home department, will be arranged with the program director. Successful completion of the program is recognized at the time students successfully complete a master's degree in their academic department.

ADMISSION: All students who take historic preservation as a minor are already enrolled as graduate students in a degree-granting department. Students should apply to the director of the program at the above address for admission. Individual courses are open to advanced undergraduates, but admission to the program is open only to those who have completed a bachelor of arts degree.

History

College of Arts and Science
101 Read Hall (573) 882-2481

FACULTY

Charles E. Timberlake, chair, professor, PhD, University of Washington. Modern Russia.

John L. Bullion, associate chair and director of graduate studies, professor, PhD, University of Texas-Austin. American colonial history.

Richard T. Bienvenu, director of undergraduate studies, professor, PhD, Harvard University. European intellectual history.

N. Gerald Barrier, professor, PhD, Duke University. South Asia history.

Winfield J. Burggraaff, professor, PhD, University of New Mexico. Latin American history.

Gerard H. Clarfield, professor, PhD, University of California-Berkeley. American diplomatic history.

Robert M. Collins, professor, PhD, Johns Hopkins University. Recent United States history.

Noble E. Cunningham Jr., Curators' Professor emeritus, PhD, Duke University.

Susan Flader, professor, PhD, Stanford University. American West, American environment.

Kerby A. Miller, professor, PhD, University of California-Berkeley. American immigration, modern Irish history.

Charles G. Nauert Jr., professor, PhD, University of Illinois. Renaissance, Reformation.

A. Mark Smith, professor, PhD, University of Wisconsin-Madison. Medieval Europe, history of science.

Jonathan Sperber, professor, PhD, University of Chicago. Modern Germany.

Arvarh E. Strickland, professor emeritus, PhD, University of Illinois.

Steven Watts, Middlebush Professor, PhD, University of Missouri-Columbia. American cultural and intellectual history.

Russell Zguta, professor, PhD, The Pennsylvania State University. Medieval Russia.

Theodore Koditschek, associate professor, PhD, Princeton University. Modern British social history.

Mary Neth, associate professor, PhD, University of Wisconsin-Madison. 20th century United States, history of American women.

Lawrence Okamura, associate professor, PhD, University of Michigan-Ann Arbor. Ancient, late antiquity, Roman frontier.

Julius E. Thompson, associate professor, director of black studies, PhD, Princeton University. African-American history.

Robert E. Weems Jr., associate professor, PhD, University of Wisconsin-Madison. African-American history.

LeeAnn Whites, associate professor, PhD, University of California-Irvine. Civil War and Reconstruction, women, 19th-century South.

Eli Zaretsky, associate professor, PhD, University of Maryland. United States progressive era, history of the family.

Carol Anderson, assistant professor, PhD, The Ohio State University. 20th century United States diplomatic, African-American.

Mark M. Carroll, assistant professor, PhD, Houston. U.S. South.

Lois L. Huneycutt, assistant professor, PhD, University of California-Santa Barbara. Medieval Europe, women.

Abdullahi A. Ibrahim, assistant professor, PhD, Indiana University. Africa, Islamic history.

Linda Reeder, assistant professor, PhD, Rutgers University. Modern European history, women.

John H. Wigger, assistant professor, PhD, Notre Dame University. United States social and cultural history to 1865.

Ian Worthington, assistant professor, PhD, Monash. Ancient Greece.

DEGREES: MA and PhD in history

The department's graduate programs are founded on an excellent faculty. Fifteen of its members have won research awards. Sixteen have received prizes for the quality of their teaching. All of the faculty bring a common commitment to excellence in graduate education.

Lecture courses, seminars and directed research projects are available on the histories of Western Europe, Russia, Great Britain, South Asia, Africa, East Asia, Latin America and the United States. While students are expected to get specialized training in the fields of their choice, they are also urged to develop a broad historical background. Cooperation among other departments and other campuses within the University

of Missouri System allows students to design programs of interdisciplinary specialization.

Ellis Library has substantial research materials in all fields of graduate study, including an unusual collection of more than 5,000 pamphlets on 17th- and 18th-century British history and 18th- and 19th-century British and continental journals, including publications of all the major academies. The Health Sciences Library has excellent publications on the history of medicine. An additional resource is the Western Historical Manuscript Collection, a unique depository of material for regional studies in political, social and economic history. The State Historical Society of Missouri has an outstanding library of finding aids and primary and secondary works dealing with Missouri history. The graduate program also has available the resources of the Truman Library at Independence, Missouri.

Applicants may compete for departmental and Graduate School fellowships for entering students. Graduate School fellowships require departmental nomination. Interested students should consult with the director of graduate studies for further details.

The department provides qualified students the opportunity to gain college-level teaching experience as teaching assistants who conduct discussion sections in American and European history. Pending administrative approval, they earn at least $9,348 an academic year and carry nine semester hours. Each appointment is subject to annual review and may be renewed up to a maximum of five years.

When students begin work on their doctoral dissertations, they may apply for departmental fellowships and travel grants to assist their research and writing.

Applicants for admission must take the Graduate Record Examination at their earliest convenience, and have the score sent to the Department of History, 101 Read Hall.

For fellowship and assistantship application forms and additional information concerning financial aid or degree programs write the Director of Graduate Studies in History, 101 Read Hall, Columbia, MO 65211.

Applications for financial aid should be filed by Feb. 1 and will not be considered after that date. Announcements of awards are made no later than April 1.

MASTER'S DEGREE: The Department of History requires all applicants for the MA to send to its director of graduate studies a short essay (no more than 500 words) in which they explain their aims and expectations in graduate study. This personal statement should indicate the fields in which they plan to specialize, professional and vocational goals, and other reasons for wishing to continue their study.

The department also requires additional evidence that will assist it in judging applicants' prospects for success in graduate work. To be considered for admission, students with the bachelor's degree must have:

- GPA of 3.0 (A=4.0) over the last 60 hours of undergraduate work,
- GPA of 3.3 in undergraduate history courses and at least 18 hours in history,
- Three letters of recommendation from faculty familiar with their work,
- One or more samples of written work from a course, and
- Graduate Record Examination (GRE) scores.

The committee on graduate admissions may waive a requirement, if the prospective adviser of the applicant recommends such a step. Also, promising students who do not meet one or more of these criteria may, at the discretion of the committee, be encouraged to enroll as post-baccalaureate special students. To be considered for admission to the graduate program, post-baccalaureate special students must complete nine hours of history at the 300 and/or 400 level with a minimum 3.3 GPA (A=4.0).

Early in the first term of residence at MU, the student is assigned an adviser who assists in planning an MA degree program. To establish academic residency, students must complete nine hours in each of their first two semesters. Not more than six semester hours of the required 30 hours of credit may be transferred from another university or campus of the UM System, or earned through nonresident research. The completed MA program must have at least 30 semester hours of graduate credit, including at least 20 hours in history and at least 15 hours in 400-level courses. Not more than 12 semester hours may be taken in individually directed work. At the end of the MA program, the candidate must pass an oral examination.

Students may elect either the non-thesis program (which must include at least two research seminars) or the thesis program (which requires six credit hours of thesis research in History 490, or in seminars, plus completion of an acceptable thesis). Students who elect the non-thesis MA are not allowed to continue for the PhD at MU.

There is no foreign language requirement for the MA degree, but students who wish to go on for the PhD are urged to pass a reading comprehension examination in at least one foreign language during their first year of graduate work.

DOCTORAL DEGREE: To be considered for admission, students who have completed the MA elsewhere should have:

- Three letters of recommendation from faculty familiar with their work,
- Completed master's thesis or, if the work is in progress, a sample chapter and a detailed outline and,
- If their master's program does not require a thesis, the committee on graduate admissions may accept a research seminar paper in lieu of a thesis, or require the student to write a master's thesis at MU.

All admissions of doctoral candidates from outside the department are provisional. Students must pass the qualifying examination for admission to the doctoral program no later than the beginning of their third semester in residence. In determining whether to admit a student provisionally, the committee on graduate admissions must consult closely with the student's prospective advisers. The committee reserves the right to reject otherwise qualified students if (1) faculty members on or off the committee believe that the history department cannot provide the applicant with an adequate program in the area of interest; or (2) no faculty member is willing to supervise the work.

Early in the first semester of post-MA enrollment, prospective doctoral candidates should arrange with the director of graduate studies for a provisional advisory committee. This committee administers the oral qualifying examination during the first week of the student's second semester in residence. The examination focuses on the MA thesis and the thesis field or, in cases where the student has no MA thesis, on a seminar paper or other research paper plus the field in which that paper is written. Only after passing the qualifying examination will the student be admitted to candidacy for the PhD degree in history. For a student whose MA program was done at MU, the final oral examination for the MA, based on the thesis and the thesis field, constitutes the qualifying examination. The student may proceed beyond the MA degree only upon the recommendation of the MA examining committee.

After completing the qualifying examination, a student, with the adviser's assistance, applies for degree candidacy and requests the appointment of a doctoral program committee. This committee, which is directed by the adviser, certifies the qualifying examination, assists the candidate in planning a program of study and administers the comprehensive examination. The examination, both written and oral, covers all areas of study offered for the PhD, including the dissertation field.

For a PhD in history, a candidate must offer a dissertation field, two areas of study in the same broad subdivision of history (Europe, United States or Latin America and Asia) that encompasses the dissertation field, one area in another broad subdivision of history and one area outside the department that complements the student's historical interests.

A candidate may choose a dissertation field from the following: 1) Non-U.S. history: Greece, Rome, Medieval, Renaissance and Reformation, Early Modern Europe, Britain before 1688, Britain from 1688, Modern Europe (1789-present), France, Germany (1789-present), Kievan and Muscovite Rus', Modern Russia (Peter the Great to the present), European Intellectual History, History of Science, India, Latin America, Africa and East Asia; 2) U.S. history: American Colonial and Revolutionary History (to 1787), the National Period of the United States (1787-1877), Recent United States (1877-present), the South, Women's History, the West and Environmental History, Diplomatic History, Social History, Cultural and Intellectual History, African-American History, Urban and Immigration History.

Before admittance to the comprehensive examination, a candidate must meet the language and other research technique requirements. Mastery of at least one foreign language to a prescribed level of ability to translate into English is required. This mastery must be demonstrated by examination by members of the department. The candidate must meet the remainder of the requirement in one of two ways:

- Demonstrate high proficiency in one language as verified by members of the department who use that language in their research.
- Mastery of an approved research technique (designed to contribute directly to the candidate's capacity to conduct research in history) either by examination or by approved

graduate work.

The doctoral dissertation is written under the direction of the candidate's adviser who is a member of the doctoral faculty of the history department at MU. The final examination is oral and open to the general faculty. It is both a defense of the dissertation and an examination on the dissertation field.

COURSES

N.B. Students in the graduate program in history may not receive graduate credit for history courses numbered 201-299.

201—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

202—America's Environmental Experience (1-8). Team-taught analysis of American thought and action on physical environment during 19th-20th centuries. Relation between politics, economics, technological change, environmental quality; roles of science, law, regulatory agencies, grassroots action. Topical satellite courses offered concurrently.

203—Ireland: Revolution and Nationalism, 1780-1976 (3). Investigates Ireland as an early example of the kind of colonial revolt later typical of the Third World. Emphasizes growth of nationalism, republicanism and the failure to create one Ireland. Prerequisite: sophomore standing.

204—Power and Oratory in Ancient Greece (3). (same as Classical Humanities 206). Concentrates on the rise of oratory in Greece and how oratory was exploited for political ends. Special attention will be paid to the Athenian Democracy in the fifth and fourth centuries BC. Prerequisite: sophomore standing or instructor's consent.

205—The Greek World (3). Political and social institutions, intellectual life of Greek city-states to time of Alexander.

206—The Roman World (3). Rise and development of Roman institutions, Rome's imperialism and culture through reign of Marcus Aurelius.

209—Alexander the Great and the Hellenistic World (3). Alexander's conquest of the East to 323 B.C.; political, social, economic development of Hellenistic kingdoms from his death to 31 B.C.

210—History of Missouri (3). Survey of Missouri's development from the beginning of settlement to present. cor.

217—History of Religion in America to the Civil War (3). (Same as Religious Studies 217) Studies major American religious traditions from the Age of Discovery to the Civil War, especially the evolution of religious practices and institutions and their influence upon American social, intellectual and political developments. Prerequisite: sophomore standing. f.

218—History of Religion in Post-Civil War America (3). (same as Religious Studies 218). Surveys major American religious traditions from 1865 to the present. Focuses on the evaluation of religious practices and institutions and their interaction with and influence upon American social, intellectual and political developments. Prerequisite: History 217, Religious Studies 217 or instructor's consent.

221—Europe in the Nineteenth Century (3). Political, social, economic, and cultural development of Europe from French Revolution to outbreak of World War I.

225—Early Christianity (3). (same as Religious Studies 202) History of Christian origins and of the patristic period of the church; study of the beliefs and practices of Christianity, as reflected in its literature, art, music, architecture. Prerequisite: Sophomore standing.

226—Medieval Christianity (3). (same as Religious Studies 203). Study of the doctrinal developments, major theologians and schools, institutional formation and dissolution, mysticism, and liturgical expression within the context of cultural and political history. Beginning with Augustine and concluding with the 15th century. Prerequisite: 102 or 202.

227—History of Christianity, 1500-Present (3). (same as Religious Studies 204). Protestant and Catholic Christianity in age of European expansion; enlightenment; 19th- and 20th-century challenges and responses. Prerequisites: Religious Studies 102, 202 or 203.

230—Ukrainian History from Medieval to Modern Times (3). A successor state of the former Soviet Union, Ukraine occupies a strategic position in Eastern Europe. The course will trace the long, turbulent history of this East Slavic nation, culminating the independence in 1991.

231—Contemporary Europe (3). Political, social, and economic development of Europe from 1900 to the present, with emphasis on the period between the two world wars.

235—Religious Biography: Black Religion (3). Studies black American religion through the biographies of representative and influential figures of the 19th and 20th centuries, including Nat Turner, W.E.B. Du Bois, and Marcus Garvey, M.L. King, Malcolm X.

237—Women in African History (3). Focuses on the varied and changing roles of women in sub-Saharan Africa from pre-colonial times to the present. Prerequisites: sophomore standing or instructor's consent.

240—Black Freedom Movement, 1955-1973 (3). Examines the dismantling of American apartheid and its transformation into a new racial control system. It also explores how and why the Civil Rights Movement was converted into a struggle for Black Power. Offered once a year.

242—Twentieth Century China (3). History of China from Nationalist Revolution of 1911 to present. A problem-oriented course: special emphasis on Mao and Maoist ideology, social, literary and cultural history also receive attention. Prerequisites: upper class or instructor's consent.

244—Chinese Women's History (3). Historical analysis of Chinese women in family, community, ideology, and national politics from the Late Imperial period to the present. Prerequisites: sophomore standing or instructor's consent.

245—Nonviolence in the Modern World (3). (same as Peace Studies 245 and South Asia Studies 245). Readings on recent world history, emphasis on Gandhi and nonviolent tradition in America Europe and the Third World. Prerequisite: sophomore standing. Writing intensive course.

246—History of Black Nationalism in the United States (3). (same as Black Studies 246). Examines the struggle of African- Americans to construct autonomous institutions, to build all- Black communities or to acquire an independent nation-state. We will study the ideology, structure, strategy and tactics. Prerequisite: History 130 or Sociology 139.

250—Nuclear America (3). This course will cover the diplomatic and military implications of nuclear energy from the discovery of fission in the 1930's to the end of the Cold War. Grades will be decided on basis of essay exams and papers. Prerequisite: sophomore standing.

251—Twentieth Century America (3). Survey of American development from 1900 to present. For students who have not taken advanced courses in American history, especially 356, 357, or 358.

252—America in the 1960's (3). (same as Peace Studies 252). Examines the political and cultural main currents of the 1960s. Emphasizes the challenges mounted by protest groups and the responses of America's political leadership to the ferment of the period. Prerequisite: sophomore standing.

255—History of the Family in America (3). The American family from the colonial period to the present, including its background in European and other societies. The focus is on family life and its connections to politics, economics and culture. Prerequisite: sophomore standing.

266—The Origins of Scientific Thought (3). This course will trace the evolution of Western science from its Egyptian-Babylonian roots to the "Copernican Revolution" of the mid-sixteenth century. Prerequisites: sophomore standing.

267—The Scientific Revolution: 1550-1800 (3). This course covers the history of science, or natural philosophy, from late Renaissance to the beginnings of the "Darwinian Revolution." Prerequisite: Sophomore standing.

270—The Early Middle Ages (3). This course will focus on the social, political, economic, and cultural development of Europe from roughly 300 to 1050. Prerequisite: sophomore standing.

271—The Later Middle Ages (3). This course will focus on the social, political, economic, and cultural development of Europe from roughly 1050 to 1500. Prerequisite: sophomore standing.

280—Internship in History (3). Professional training in history and archive-related fields. Prerequisites: History Department Area of Concentration; junior or senior standing; 18 hours minimum in history; 3.0 GPA minimum history; departmental consent. Graded on S/U basis only.

282—History of British India (3). (same as South Asian Studies 282). Introduction to traditional India, the Muslim experience; European rivalry and British hegemony; problems of Crown rule; social and political reforms in the making of modern India.

285—Undergraduate Seminar in Third World History (3). Readings in selected problems in the history of Africa, Asia or Latin America with reports and discussion. Prerequisite: junior standing, fifteen hours of history or instructor's consent. Departmental consent for repetition.

286—Undergraduate Seminar in European History (3). Readings in problems in European history with reports and discussion. Prerequisite: junior standing, fifteen hours of history or instructor's consent. Departmental consent for repetition.

287—Undergraduate Seminar in American History (3). Readings in selected problems in American history with reports and discussion on selected topics. Prerequisite: junior standing, fifteen hours of history or consent of instructor. Departmental consent for repetition.

287A—Undergrad. Seminar in American History: History of Race in the US (3). (same as Black Studies 287A). Readings on problems in American history with reports and discussion on selected topics. Prerequisite: junior standing, fifteen hours or instructor's consent. Departmental consent for repetition.

288—Undergraduate Thesis (3). Individually directed research leading to a senior thesis. Prerequisite: senior standing. f,w.

289—Undergraduate Thesis (3). Continuation of 288. Prerequisite: senior standing. f,w.

297—Honors Thesis (3). Research and completion of the thesis required for graduation with Honors in History. f.

298—Honors Thesis (3). Continuation of 197. w.

300—Special Problems (1-99). Independent investigation leading to a paper or project.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

305—Philip II, Alexander the Great, and Macedonian Imperialism (3). Concentrates on the history and politics of Greece during reigns of these two kings along with Alexander's military conquests and various controversies from the period. Prerequisite: junior standing or instructor's consent.

310—The Roman Empire (3). Roman imperialism; management of, and rebellion in, the Empire; cultural exchange between Rome and its provinces.

311—The Later Roman Empire (3). Political, religious and cultural life in Late Antiquity, from the "soldier emperors," to the barbarian kingdoms and early Byzantium.

319—Intellectual History of Europe, 17th and 18th Centuries (3). The Enlightenment's attack on traditional Christian thought and values.

320—Intellectual History of Europe, 19th and 20th Centuries (3). Topics include: Romanticism, Darwin, Marx and Freud.

326—Modern England (3). Surveys British history in the

18th and 19th centuries. Emphasizes social and economic change.

327—The Age of the Renaissance (3). Major changes in European economic, social, political, religious, and intellectual life between 1250-1500. Humanism and Renaissance. The "Renaissance problem."

328—The Age of the Reformation (3). State of Europe about 1500. Political, diplomatic, social, and intellectual changes to 1648. Humanistic reform movements. Protestant-Catholic Reformation. Development of the modern state and international relations.

331—Revolutionary France, 1789-1851 (3). Revolutionary upheavals of the revolutionary-Napoleonic era, which destroyed traditional French society and laid the basis for modern France.

333—Germany in the Nineteenth Century (3). Cultural, social and political history of Central Europe from 1800 to 1914. A case study in incomplete modernization, focused on industrialization, unification, cultural crisis and imperialism.

334—Germany in the Twentieth Century (3). Cultural, social and political history from 1914 to present day. Focus on world wars, national socialism, the holocaust, the cold war and the emergence of East and West Germany.

335—Modern France 1815 to Present (3). Principal social, economic, and political developments in modern French history from the restoration to the present day.

339—Imperial Russia, 1682-1825 (3). Russia in the 18th and early 19th centuries, with special emphasis on the reigns of Peter I, Catherine II, and Alexander I.

340—The Russian Revolution (3). Analyzes the transformation of Russian society that produced the collapse of autocracy, efforts to create a parliamentary government, the Bolshevik seizure of power in 1917, and the civil war that followed. f.

342—Age of Jefferson (3). Political, constitutional, cultural, and economic developments in United States during formative period of Republic, 1787-1828. Special attention to Constitutional Convention, formation of national political institutions.

349—Introduction to U.S. Social History (3). Study of daily life and the ways ordinary Americans experienced historical change. Considers such topics as work, leisure, family and community. Compares how people's experiences varied by region, class, gender, ethnicity, and race.

350—Special Readings (1-99). Individual work, with conferences adjusted to needs of student.

351—American Cultural and Intellectual History to 1865 (3). Origins and growth of American values and ideas considered in their social context. Topics include: the work ethic, republican politics, revivalism, reform movements, sexual attitudes, literature in the marketplace, Afro-American and slave-holding subcultures.

352—American Cultural and Intellectual History Since 1865 (3). Tensions and transformations in American culture to the present. Topics include: spiritual crisis in Christianity; rise of welfare state liberalism; socialist and feminist alternatives; literature and the arts.

353—American Urban History (3). Growth, development and implications of the city in American history; historical analysis of urban problems.

354—History of Work in the United States: 1830 to the Present (3). Treats the history of American workers and labor organizations from 1820 until the present with special emphasis on the interaction between work and culture. Prerequisite: junior standing or instructor's consent.

356—Origins of Modern America, 1877-1919 (3). Political, social, economic, and intellectual evolution of America into a modern society, 1877-1918.

357—Recent United States History 1918-1945 (3). Detailed examination of American history from end of World War I to end of World War II.

358—Our Times: United States Since 1945 (3). Detailed examination of American history from end of World War II to the present.

359—History of the Old South (3). Study of the South to 1860. cor.

360—History of the New South (3). Study of the South since 1860.

361—The Great West in American History (3). Historical development of major regions, with emphasis on response to environment, public land policy, role of government in economic and resource development, citizen action, and cultural pluralism.

362—The Ordeal of the Union, 1848-1877 (3). All major aspects of the period considered; rivalry between nationalizing and sectionalizing forces emphasized.

363—American Colonial History to 1760 (3). Study of colonial America; special emphasis on creation of a native American culture prior to 1760.

364—The Period of the American Revolution, 1760-1789 (3). Analysis of the Revolution, its causes and consequences, through establishment of the new government in 1789. cor.

365—History of the American Environment (3). A reading and discussion course exploring diverse responses to the changing American environment from early man to the present, including ecological, institutional, and philosophical aspects.

369—History of Caribbean America (3). Comparative regional study of insular and mainland Caribbean nations. Emphasis on modern period. Independence; abolition of slavery; U.S. hegemony; economic, social, and political upheaval.

370—American Foreign Policy from Colonial Times to 1898 (3). (same as Peace Studies 371).

372—U.S. Foreign Relations, 1898-1945 (3). A history of American Foreign Policy from the Spanish American War to the end of World War II. Prerequisite: sophomore standing.

373—The Age of Ascendancy: U.S. Foreign Relations, 1945-Present (3). Surveys the Cold War in Europe and Asia, the Korean and Vietnam Wars, and Middle East policy. Prerequisite: sophomore standing.

374—Introduction to Archives and Manuscripts (3). (same as Information Science and Learning Technology Q320). Introduction to value and use of archives and manuscripts, to develop awareness of the unique role of archives and manuscript repositories as information resources; concepts, terminology, and archival principles. w,s.

375—Historic Preservation (3). (same as Art History and Archaeology 375). "State of the art" survey of the historic preservation movement and techniques by UMC faculty and guest speakers active in the field.

377—History of Mexico (3). Survey of Mexican history from Cortes to present day.

378—Social Revolution in Latin America (3). Twentieth century social revolutions in selected Latin American countries.

384—Religion and Politics in Modern India, 1857-1947 (3). (same as South Asia Studies 384). Attention to religious revival and reform as important elements in the development of regional and national political patterns.

389—Economic Characteristics of the African American Experience (1). (same as Black Studies 389). Examines how economic considerations have influenced African American history from the trans-Atlantic slave trade to the present. Prerequisite: junior standing or instructor's consent. w,s.

391—African-Americans in the Twentieth Century (3). (same as Black Studies 391). Surveys the African-American experience from 1900 to the present. Attention is given to economic, political, social, and cultural trends.

399—Quantitative Methods in Historical Study (3). Introduces quantitative approaches to the study of history. Emphasizes opportunities, limitations, and dangers involved in several common forms of quantitative study.

400—Problems (1-99). (same as South Asia Studies 400). Individual work not leading to dissertation. Prerequisite: instructor's consent.

401—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: Senior or graduate standing, and department consent. May be repeated to maximum of 6 hours.

405—Greek Historiography (3). (same as Greek 406). Study of the major contemporary historians of Classical Greece and their methodology. Differential readings available to both students with a reading knowledge of Greek and also those without Greek.

406—Seminar in Ancient History (3). Readings and research on selected problems in ancient history. May be repeated to a maximum of 12 hours.

407—Readings in Ancient History (3). Reading of standard works and recent scholarship on selected problems in ancient history. May be repeated a maximum of 12 hours.

410—Introduction to Historical Research (3). Introduction to historical methods, source problems, bibliographical aids, source criticism, use of related techniques. Required of graduate students in History.

411—Readings in Russian History (3). Reading standard works and current scholarship on selected problems in Russian history. Reading knowledge of Russian, French, or German helpful but required only of students specializing in Russian history. May be repeated to a maximum of 6 hours.

412—Historiography (3). Acquaints graduate students with examples of modern historical thought and practice by examining various conceptual approaches to the study of history. Departmental consent required. May be repeated to a maximum of six hours.

413—Archives Administration (3). (same as Information Science and Learning Technology Q447). Principles and concepts of archival/manuscript techniques and administration of archival agencies and manuscript repositories. Includes legal and sociological implications of archival theory and practice. f, alt. s.

414—Readings in American Women's History (3). Reading, discussion, and analysis of the historiography of the field. May be repeated to a maximum of 6 hours.

415—Seminar in American Women's History (3). Directed research and writing in American women's history. May be repeated to a maximum of 6 hours.

416—Readings in Gender, Race and Class (3). Readings in recent research material focused on the analysis of the intersections of gender, race and class in particular times and places. May be repeated to a maximum of six hours.

420—Independent Readings for History Ph.D. Comprehensive Examination (1-99). Independent readings for Ph.D. Comprehensives. Open only to graduate students formally admitted to candidacy for Ph.D. in history.

421—Seminar in British History (3). Investigation of social, intellectual problems of modern Britain. May be repeated to a maximum of 6 hours.

423—Readings in English History (3). Readings in historical literature covering period since 1660; particular reference to new interpretations of political, social developments. May be repeated to a maximum of 6 hours.

426—Readings in Medieval History (3). Readings in medieval history and historiography with emphasis on current scholarship. May be repeated to a maximum of 6 hours.

427—Seminar in the Renaissance and Reformation (3). Analyzes problems of the period 1300-1600; emphasizes intellectual history. May be repeated to a maximum of 6 hours.

428—Readings in Early Modern European History (3). Readings in historical classics and current scholarship on Renaissance, Reformation, Baroque, and Enlightenment periods. Problem of modernity. May be repeated to a maximum of 6 hours.

429—Readings in History of Science (3). Readings in

history and historiography of Pre-Darwinian science with emphasis on recent scholarship. May be repeated to a maximum of 6 hours.

431—Readings in Modern European History (3). Readings in recent research material on selected topics. May be repeated to a maximum of 6 hours.

432—Seminar in Modern European History (3). Investigation of problems of modern Europe. May be repeated to a maximum of 6 hours.

436—Readings in American Colonial History (3). Readings in American history from beginning of English settlements to adoption of the Constitution. May be repeated to a maximum of 6 hours.

437—Seminar in the History of Colonial America (3). Directed research in the colonial and revolutionary period of American history. May be repeated to a maximum of 6 hours.

438—Readings in African-American History (3). (same as Black Studies 438). Readings on selected topics in African-American history from 1619 to the present, with emphasis on conflicting interpretations. May be repeated to a maximum of six hours.

439—Seminar in African-American History (3). (same as Black Studies 439). Directed research in selected topics in African-American history. May be repeated to a maximum of six hours.

440—Readings in American Religious History, 1750-1850 (3). This class will examine important ideas and trends in the field, with an emphasis on popular religious movements. This is a reading-based seminar, revolving around discussion of influential recent books.

441—Seminar in the National Period of United States History (3). Directed research in the period 1787-1861. May be repeated to a maximum of 6 hours.

442—Readings in the Age of the Federalists and the Jeffersonians (3). Directed readings in American history from the Constitution to the election of Jackson; class periods devoted to critical evaluation. May be repeated to a maximum of 6 hours.

443—Readings in the Age of Jackson 1824-1850 (3). Continuation of 442, from election of Jackson to Civil War. May be repeated to a maximum of 6 hours.

445—Seminar in United States Immigration History (3). The course will focus on historiography of American immigration, Mainly European immigrants during 1820-1920. Special attention given to books and articles published in the past 25 years.

447—Readings in Sectional Controversy, Civil War and Reconstruction (3). Directed readings and discussions of major issues in the period of national unification of the United States, from 1850 through 1877. May be repeated to a maximum of 6 hours.

448—Readings in American Social History (3). Reading, analysis, and critical reviews of pivotal works. Stress on varieties and impact of social history on topics such as family, race, gender, ethnicity, work. May repeat to 6 hours maximum.

449—Seminar in American Social History (3). Directed original research and writing in American social history. May be repeated to maximum of 6 hours.

450—Research (1-99). Work equal to research done for a dissertation, but not leading to thesis. Prerequisite: instructor's consent.

451—Seminar in American Cultural and Intellectual History (1-12). Directed research and writing in American cultural and intellectual history. May be repeated to maximum of 12 hours.

452—Readings in American Cultural and Intellectual History (3). Reading and discussion designed to promote critical understanding of theoretical and historiographical problems in American cultural and intellectual history. May be repeated to maximum of 6 hours.

453—Seminar in United States Sectionalism, Civil War & Reconstruction (3-12). Directed original research on political and related topics of the period 1848-1877. May repeat to 6 hours maximum.

454—Readings in American Western and Environmental History (3). Readings, class discussion, and written analysis on topics in American Western and environmental history from early settlement to the present. May be repeated to a maximum of 6 hours.

455—Seminar in American Western and Environmental History (3-6). Directed research in problems in American Western and environmental history. May be repeated to maximum of 6 hours.

456—Readings in World Environmental History (3). Readings explore relationship between human agency and environmental change over the courses of world history and on various continents. Prerequisite: graduate standing. f, alt yrs.

460—Readings in the History of the South (3). Group readings and appraisal of controversial interpretations in Southern history. May be repeated to a maximum of 6 hours.

461—Seminar in the History of the South (3). Directed research in the history of the American South.

464—Readings in the Origins of Modern America (3). Selected studies of major issues in American history, 1877-1929. May be repeated to a maximum of 6 hours.

465—Readings in Recent United States History (3). Critical evaluation of writing in American history in period 1929-present. May be repeated to a maximum of 6 hours.

467—Seminar in the Origins of Modern America (3). Selected topics and studies in American political and social history since the Civil War. May be repeated to a maximum of 6 hours.

468—Seminar in Recent United States History (1-12). Advanced seminar in American history from 1929 to present. May be repeated to a maximum of 6 hours.

470—Readings in Latin American History (1-6). Readings in standard and recent historical literature, with critical discussion of reports on special topics. May be repeated to a maximum of 6 hours.

480—Readings in the History of American Diplomacy (3). Readings in evolution of American diplomacy from the Revolution to present. May be repeated to a maximum of 6 hours.

481—Seminar in Recent American Diplomatic Problems (3). Directed research in problems of 20th-century American diplomacy. May be repeated to a maximum of 6 hours.

490—Research (1-99). Graded on a S/U basis only. f,w,s.

491—Seminar in European Intellectual History (3). Research on selected problems in the intellectual history of Europe in 18th, 19th and 20th centuries. Reading knowledge of one of following required: French, German, Italian, Russian. May be repeated to a maximum of 6 hours.

Horticulture

College of Agriculture, Food and Natural Resources
1-87 Agriculture Building (573) 882-7511
Fax [573] 882=1469

Note: Horticulture, agronomy, entomology and plant pathology comprise the Plant Science Unit of the College of Agriculture, Food and Natural Resources, with Linit serving as unit leader.

FACULTY

Michele R. Warmund, director of graduate studies, associate professor, PhD, University of Missouri-Columbia. Fruit crop physiology.

John H. Dunn, professor, PhD, Rutgers University-New Brunswick. Turf management.

Christopher J. Starbuck, associate professor, PhD, Oregon State University-Corvallis. Woody ornamentals, floriculture extension.

David H. Trinklein, associate professor, PhD, University of Missouri-Columbia. Greenhouse management.

Lewis W. Jett, assistant professor, PhD, Virginia Polytechnic Institute. Vegetable crops.

Denny Schrock, extension assistant professor, PhD, University of Minnesota. Home horticulture.

DEGREES: MS and PhD in horticulture

Graduate study in horticulture currently provides emphasis in stress mechanisms, water relations and physiological processes as they apply to horticultural commodity areas, which include pomology, olericulture, floriculture, woody landscape plants and turf. The MS program prepares students for positions in horticultural business and production operations, plant-related industries, extension, government, teaching or pursuit of the PhD.

The PhD prepares students for research and teaching careers in colleges and universities, and positions in extension and large horticultural or horticultural-related businesses.

Fellowships, scholarships and research assistantships may be available for qualified students seeking graduate education. For information on current availability, write to the Director of Graduate Studies in Horticulture, 1-87 Agriculture Building, Columbia, MO 65211.

MASTER'S DEGREE, THESIS AND NON-THESIS OPTIONS

MS WITH THESIS: To be accepted for advisement, the student must have satisfactorily completed all courses in basic science and horticulture required for a BS in Plant Science with a horticulture emphasis. Students not meeting this requirement may enroll in basic science and horticulture courses as post-baccalaureate special students until the requirement is met.

All students are required to take a qualifying/diagnostic examination to determine proficiency in horticulture and science. The exam helps guide the adviser in formulation of a study program. Additional University credits may be required if the examination suggests such need. A course of study is then designed to fit each student's academic background, experience and objectives. A student must complete a minimum of 30 semester hours of graduate work, including at least 15 hours at the 400-level. Not more than 12 hours of the minimum 30 hours is permitted for research, problems, special investigations and special readings. All graduate students are required to participate in all departmental educational activities, such as seminars. There is no language requirement for the master's degree.

A thesis is required of all candidates. A candidate must fulfill the approved course of study with a grade of B (A=4.0) or better and pass a written or oral examination upon completion of the course work and the thesis.

MS WITHOUT THESIS: A program leading to the MS degree without a thesis, but having the same basic requirements as above, also is available to students who would benefit from addi-

tional study, but do not plan to pursue a PhD. This program is designed for students preparing to become a research technician, or for positions in teaching of vocational-oriented programs, extension, government, or industries where a postgraduate degree is beneficial. Up to five hours of credit toward this degree may consist of Research 450.

DOCTORAL DEGREE: Potential candidates are screened by the departmental graduate student admissions committee. The applicant must furnish names and addresses of five references familiar with the student's previous undergraduate work or study and research toward the MS. After examining a candidate's record and current interests, the committee recommends acceptance or rejection based on past performance and suitability for study and research in current departmental programs.

After being accepted for advisement in the PhD program, a five-member doctoral program committee is appointed. Within two semesters of enrollment, the student shall present to the program committee a research proposal and submit to a qualifying examination. If passed, this examination will serve as a guide in planning the further program of study. Students accepted for advisement must regularly participate in departmental educational opportunities, such as seminars.

To be admitted for PhD candidacy, the student must pass a written and oral comprehensive examination conducted by the program committee. The degree candidate also must complete the previously approved program of study, satisfy the language or special requirements determined by the program committee and complete research and the dissertation. The candidate is required to defend the dissertation in an oral presentation and examination. After a successful defense, the dissertation approved by the program committee is submitted to the Graduate School.

COURSES

See **Agronomy** for course descriptions.

Human Development and Family Studies

College of Human Environmental Sciences
314 Gentry Hall (573) 882-4035

FACULTY

Mark Fine, chair, professor, PhD, The Ohio State University.
Marilyn Coleman, professor, EdD, University of Missouri-Columbia.
Lawrence Ganong, professor, PhD, University of Missouri-Columbia.
Jean Ispa, professor, PhD, Cornell University.
Kathy Thornburg, professor, PhD, University of Missouri-Columbia.
Teresa Cooney, associate professor, The Pennsylvania State University.
Johnetta Morrison, associate professor, EdD, Syracuse University.
Lynn Pike, associate professor, PhD, The Ohio State University.
Sara Gable, assistant professor, PhD, The Pennsylvania State University.

DEGREES: MA and MS in human development and family studies, and PhD in human environmental sciences, with an emphasis area in human development and family studies.

Students selecting the master of arts (applied emphasis) or the master of science (research emphasis) degrees may specialize in family studies, child life, early childhood, life span human development, family mediation, human services programs (emphasis in administration or public policy), and a dual degree program in HDFS and the School of Law. Programs are structured to provide students with an integration of theoretical perspectives, empirical research training, and practical experiences.

The MA and MS degrees prepare students for positions in junior college or college teaching, and leadership in both public and private human service institutions. The MS degree also provides training toward the PhD degree. The PhD program can lead to careers in research, college or university teaching, or to leadership positions in public and private human service institutions.

See **Human Environmental Sciences** for general information.

For additional information, write the Director of Graduate Studies in Human Development and Family Studies, 314 Gentry Hall, Columbia, MO 65211.

COURSES

241—Multi-Cultural Study of Children and Families (3). Study of multi-cultural (e.g., Afro-American, Hispanic, native American , Asian) groups within context of their unique cultural heritage. Special attention is focused on the external conditions that affect the internal workings of these families. Prerequisite: 175 or approval of instructor. f,w.

250—Early and Middle Childhood (3). Emotional, cognitive, and physical development of the child before puberty. Observation is integral part of course. f,w.

251—Adolescence and Young Adulthood (3). Physical, intellectual,and psychosocial maturation of adolescents and young adults within the context of lifelong developmental sequelae. Prerequisite: 3 hours Behavioral Science. w.

252—Adulthood and Aging (3). Focus is upon those factors in the family environment (nutrition, housing, finances, etc.) that have impact upon the physical, social and psychological well-being during the last half of life span development. Prerequisite: 150 or consent of instructor.

260—Drop-In Child Care Programs (2). Examination of appropriate planning for and experience in a drop-in child care program. Prerequisites: 250 or equivalent and instructor's consent. f.

261—Working With Parents (3). Understanding of parents and their perspectives, interpersonal communication and relationships; and conference and group meeting techniques. Includes experience with parent groups.

262—Infant-Toddler Development and Programs (3). Applied cognitive, language, and social development of infants and toddlers. Emphasizes development in a child care setting and staff relations. Prerequisites: 250 or equivalent, and instructor's consent. f,w,s.

263—Curriculum and Activities for the Early Childhood Setting (3). Development of Curriculum for children birth through 5 in preschool setting. Also emphasizes the development of program activities for children birth through 5; and 6 through 10 in after-school care settings. Prerequisites: 250 and may be concurrent with 262. f.

264—Child Development Laboratory (5). Experience working with young children (ages 2-6 years), and applying developmentally appropriate practice. Focus on general guidance, curriculum planning, family and staff relations. Prerequisites: 250 or equivalent and instructor's consent. f,w,s.

265—Child and Family Development Laboratory (5). Experience working with young children (ages 2-6 years) and their families, adult-child relationships, applied child development principles, and planning for parent education. Prerequisites: 250 or equivalent and instructor's consent. f,w,s.

285—Research Methods (3). Introduction to research methods in the social science. Emphasis on both qualitative and quantitative methods, as well as applied research and program evaluation. Prerequisite: sophomore standing. f,w.

298—Student Teaching Prekindergarten (4). Experience working with children (2-5 years), using general guidance principles and methods for fostering creativity. Open only to early childhood education majors with professional standing and home economics education majors. Prerequisites: 250 or equivalent and instructor's consent. f,w,s.

300—Problems (1-99). Independent work on special problems in human development and family studies. Prerequisites: instructor's consent. Graded on a S/U basis only. f,w,s.

320—Family Communication (3). (same as Communications 320).

350—Readings (1-99). Readings in recent research; critical discussions.

351—The Black Family: Past, Present & Future (3). Emphasis is on the unique social, economic, religious, educational,and political environments that have affected the structure and function of the black family. Prerequisite: 285 or equivalent and junior standing. w.

352—Stress in Families (3). The introduction to the study of stressor events in families, such as poverty, violence within families, substance abuse, and health problems. Emphasis is on both prevention and coping.

355—Recent Trends (1-2). Review of current research and/or practice in child and family development. Prerequisite: instructor's consent.

356—Child and Family Advocacy (2-3). Study of the processes of social policies, legislation and regulations affecting children and families at the local, state and federal levels. The course emphasizes current issues and need for citizen involvement.

358—Administration of Programs for Children & Families (2-3). Includes design, operation and evaluation of programs. Field experience included. Prerequisites: 264 or instructor's consent.

363—Parent-Child Relations over the Life Course (3). Examines the development, continuities, transitions, and discontinuities of parent-child relationships over the life course. Considers the influence of parents on children and children on parents. Prerequisites: 285 or equivalent.

364—Advanced Child Development Laboratory (8). Experience in working with young children (2-5 years) including developing early childhood programs and manipulative, representational,language and discovery experiences for young children;study of program models. (Consult instructor to schedule lab hours.) Prerequisites: 264 or equivalent and instructor's consent. f,w.

368—Family Interaction (3). Analysis of intrafamilial interaction from a systems perspective; includes comparative study of family paradigms, familysubsystems, goals and resources, boundaries, and patterns of feedback. Prerequisite: 175 and 285 or equivalent; or instructor's consent.

370—The Politics of Reproduction and Fertility Control (3). (same as Women Studies 370). Examines the social construction of reproduction, including discourses and practices surrounding the body, pregnancy, birth, reproductive technology and diseases. Stresses the ethical issues and

social policies affecting women. Prerequisite: junior standing or instructor's consent.

372—Children in Health Care Settings (3). Investigates organization, operation and services of modern health care settings; includes health problems and diseases of children with complex and extended care needs. Prerequisite: 150 or 250 or equivalent.

373—The Process of Divorce (3). Examination of theory and research related to marital dissolution. The impact of divorce on children and adults and divorce intervention strategies will be considered. Prerequisite: 163, 175, and 285 or equivalent; or instructor's consent.

375—History of the Family in Russia (3). Survey of family relations in Russia from the Kievan period. Materials drawn from child development and family studies, education, history, sociology, and literature. Prerequisite: 3 hours in Social/ Behavioral Sciences.

376—Activities for Hospitilized Children (2). Exposure to the work of child therapists. The focus will be on strategies that promote normal development and psychosocial health in hospitalized children and their family members. Departmental consent required.

378—Child Life Admiminstration (3). Administrative issues in the child life field including: supervising staff, documentation, policy development, program evaluation, cost-effective care, and budgeting. Prerequisite: insturctor's consent. f.

380—Child Life Practicum (3). Observation of child life staff a Children's Hospital, and experience helping children cope with hospitalization. Prerequisites: 262 and 264 and departmental consent. f,w,s.

390—Internship (1-99). Internships or field training experiences under supervision. Prerequisite: Deparmental consent. Graded on a S/U basis only. Consent of adviser.

391—The Changing American Family (3). Family studies capstone; students are expected to integrate, extend, critique, and apply the knowledge gained in the family studies option within a family life education framework. Prerequisite: 163, 175, 241, 285, and at least 2 of the following: 351, 268, 373; senior standing; or instructor's consent. f,w.

400—Problems (1-99). Independent work on special problems in human development and family studies. Prerequisites: instructor's consent. Graded on a S/U basis only. f,w,s.

401—Social and Emotional Development (3). Seminar on emotional and social development in children, with focus on research and theory on the impact of various family, school and societal factors. Prerequisite: graduate standing. w.

410—Seminar (1-99). Seminar in selected topics in human development and family studies.

412—Family Dynamics and Intervention (3). (same as Nursing 412). Theories of family function and dysfunction; techniques of assessment; models of family intervention. Practicum with selected families.

415—Readings (1-99). Readings in recent research; critical evaluation. Prerequisites: graduate standing & instructor's consent.

418—Topics (1-99). Selected current topics in field of interest.

419—Internship (1-99). Internships and/or field training experiences under supervision. Prerequisite: graduate standing and instructor's consent. Graded on S/U basis only. f,w,s.

425—Remarriage & Stepfamilies: Development, Dynamics and Intervention (3). The processes of remarriage and reconstituted family dynamics, special developmental needs and intervention models will be studied. The impact on children will be considered. Prerequisites: instructor's consent.

430—Research Methods in Human Development and Family Studies (3). Examination of the rationale for conducting scientific research; various research methods pertinent to the study of individuals over the life span, close relationships, marriages, and families; hypothesis formulation; selection of appropriate designs, instrumentation, and analyses. Prerequisite: instructor's consent.

431—Advanced Research Methods in Human Development and Family Studies (3). Examiniation of issues related to the study of individuals and their families: measurement, designs and interpretation of statistical analyses. Statistics are placed in perspective through readings and discussions of the relationships between theory, research design, and data analyses. Prerequisites: 430 or instructor's consent.

440—Work and Family (3). Study of the interaction between paid labor, unpaid labor, and the American family. Heavy concentration in placed on the roles gender, race, and history play in the workplace and in the home. Prerequisite: graduate standing and instructor's consent.

441—Advanced Seminar on Multi-Cultural Families (3). Advanced study of multi cultural (racial, ethnic, social) families within American society. Attention is focused on each group's unique cultural heritage and social environment. Prerequisite: graduate standing and instructor's consent.

450—Research (1-99). Independent research not leading to a thesis. Report required.

451—Seminar on Adolescence and Young Adulthood (3). Seminar on development in adolescence and young adulthood, with a focus on social development from a cross-cultural perspective. Prerequisite: graduate standing. w.

456—Children, Families and Public Policy (3). Seminar on societal issues relating to children and families, with focus on the development of public policies. Prerequisite: graduate standing and instructor's consent. f.

462—Cognitive Development (3). Study of the development of reasoning, perception and language. Prerequisite: graduate standing.

463—Theories of Human Development (3). Major theories of life span human development. Attention given to structure, content and major research critiqued for theoretical strengths. Prerequisite: 6 hours of 300-level Behavioral Sciences courses or instructor's consent.

469—Family Theories (3). Reviews existing family theories, their assumptions, values, propositions, and applications. Examines processes of theory testing and construction and linkages between theory and research. Prerequisite: graduate standing or instructor's consent.

488—Teaching Practicum (2-6). Supervised experience in teaching various audiences, including college students, professionals, and community residents. Prerequisite: graduate standing and instructor's consent. Graded on a S/U basis only.

489—Research Practicum (2-6). Independent research activities in conjunction with faculty. Prerequisite: instructor's consent. Graded on S/U basis only.

490—Research (1-99). Independent research leading to thesis or dissertation. Graded on a S/U basis only.

Human Environmental Sciences

College of Human Environmental Sciences
(573) 882-7014

FACULTY

Beatrice B. Smith, dean, professor, PhD, University of Minnesota.

GRADUATE PROGRAMS in the College of Human Environmental Sciences are administered by the college and the following departments:

- Consumer and Family Economics
- Environmental Design
- Nutritional Sciences
- Human Development and Family Studies
- Social Work (School of)
- Textile and Apparel Management

General information is contained in this section. Faculty and degrees are listed by department under the individual fields of study.

The College of Human Environmental Sciences offers graduate study in various disciplines. Programs emphasize the interrelationships of human factors with the socioeconomic environment, and the food, clothing and shelter aspects of the physical environment.

Master's degree programs are planned individually to meet the needs and objectives of students. Subject areas that may serve, singly or in combination, as a focus for the master's program include human development, family studies, nutritional sciences, exercise physiology, textile and apparel management, environmental design, and consumer and family economics. Students with these master's degrees are in demand for positions in extension, government service, business, teaching and research.

The PhD program is designed to prepare students for research, college teaching or other advanced professional careers requiring a high degree of understanding and competence. Each PhD program in human environmental sciences is planned individually and will focus upon a specific area: human development and family studies, textile and apparel management, consumer and family economics, environmental design, nutritional sciences, or exercise physiology.

Research facilities in Gwynn and Stanley halls and Rothwell gymnasium are available for graduate students. For social and behavioral sciences research, computers and terminals for mainframe access for manuscript preparation and statistical analysis are readily available. Also available are nutrition laboratories, exercise physiology laboratories, humidity- and temperature-controlled areas for textile research and four child development study laboratories. Costume and fabric collections are housed in Stanley Hall; visual records are available for use by graduate students. Students in environmental design have access to a resource library and studio equipped with catalogs, samples, computers and design equipment.

University Hospital and Clinics, the Agricultural Experiment Station laboratories, the whole-body counter and the MU Research Reactor provide additional opportunities for study. Students in nutritional sciences make considerable use of the Health Sciences Library. Those planning historical studies use documents of the State Historical Society of Missouri.

Research opportunities and facilities in the college are extended by cooperation with other schools and divisions on campus. The state specialists in human environmental sciences extension, who are faculty members of the college, work closely with the teaching and research faculty in providing graduate students with opportunities for research and experience in both rural and urban areas. The college also participates in the Missouri Agricultural Experiment Station research projects. Teaching and research assistantships and other opportunities for part-time work are available to qualified students at

both the master's and PhD levels. Teaching assistantships provide supervised experience in college teaching activities. Applications should be submitted before April 1 of each year, although inquiries may be made any time. Information also is available on national fellowships. ***For application forms, write the Director of Graduate Studies, 114 Gwynn Hall, Columbia, MO 65211.***

MASTER'S DEGREES: Requirements for admission to the master's program are:

- A 3.0 (A=4.0) GPA for the last 60 hours from an accredited college (applicants with slightly lower GPAs may ask for a review of their credentials to determine potential for success with consideration given to aptitude, motivation and performance in the student's major area)
- Acceptable performance on the GRE general test. Applicants to the Department of Environmental Design are required to present a portfolio for review.

Upon acceptance of the student into the program, the adviser or advisory committee determines what undergraduate courses, if any, are required to provide a sound basis for graduate study. The study program includes courses needed to update the student's knowledge and those required to attain master's-level competency in a subject area.

The minimum course requirements are 30 hours of graduate-level courses, including at least 15 hours in courses at the 400 level. Not more than 12 hours of the 30 may be in problems, readings, research and other independent study. To complete the degree requirements, a written or oral examination is required.

Each student must successfully complete an independent study project. A student normally enrolls for six to eight hours in thesis research (490) or four to six hours in non-thesis research (450). Non-thesis research may lead to a paper, publication or other evidence of successful completion of the research. For instance, a student in environmental design might do a restoration study on a historic Missouri home, with renderings of the restoration and documentation.

DOCTORAL DEGREE: Requirements for admission to the doctoral program are:

- A GPA of 3.0 (A=4.0) or higher in previous graduate work, as reflected in approximately 30 hours of graduate-level courses;
- Acceptable performance on the GRE general test. Applicants desiring emphasis in environmental design are required to present a portfolio for review.

Approval to begin work on a PhD program depends upon the student's qualifications and the availability of the faculty and facilities. Consideration also is given to grades in the major area of interest, and to maturity, experience, motivation and other factors that indicate potential for success in the program. Graduate aptitude test scores should indicate ability at the PhD level and an aptitude for the area of study.

A written or oral qualifying examination, administered by the student's doctoral program committee, must be passed before admission to the PhD study program. Students recently completing master's degrees may request that the master's degree be considered a qualifying examination.

The student and adviser develop a preliminary program plan, considering specific background, strengths, weaknesses and objectives, which serves as the basis of the final program to be approved by the program committee. Courses must be completed with a grade point average of 3.0.

A student becomes an official candidate for the PhD degree after successfully completing the course work and passing the written and oral comprehensive examination. A written dissertation based on original research and an oral examination defending the dissertation must be completed.

COURSES

310—Senior Seminar (0). Non-credit course for seniors, open to home economics education majors. A series of seminars relating to philosophy and responsibilities in preparation for a profession.

355—Recent Trends in Human Environmental Sciences (1-3). Selective review of current issues and related research in home economics and its specializations, emphasizing the integrative nature of the field. Relevant theories and principles will be reviewed. Prerequisite: instructor's consent.

412—Introduction to Research in Human Environmental Sciences (1). Introduces research trends and needs in areas of interest to home economics, location, and interpretation of research bearing on specific subjects, planning research projects, and analyses of results and drawing conclusions.

Industrial and Manufacturing Systems Engineering

College of Engineering
E3437 Engineering Building East (573) 882-2691
http://www.missouri.edu/~inengwww

FACULTY

Larry G. David, chair, director of undergraduate studies, professor, PhD, Purdue University. Quality control systems; statistical applications to manufacturing; analysis of capital expenditures; human factors engineering; product liability and safety.

Cerry M. Klein, director of graduate studies, professor, PhD, Purdue University. Mathematical programming, combinatorial optimization; applied mathematics; location theory; fuzzy sets; OR applications to manufacturing systems.

Owen W. Miller, professor emeritus, DSc, Washington University. Statistical process control/statistical quality control; productivity enhancement for small business; IE/OR applications; Taguchi Methods for small business.

C. Alec Chang, associate professor, PhD, Mississippi State University. Automated measurement and inspection with computer vision; product design and quality engineering; multi-sensor fusion; management information systems.

James S. Noble, associate professor, PhD, Purdue University. Material flow systems; material handling; facilities design; production economics; design economics; performance measurement; production planning and control.

Luis G. Occeña, associate professor, PhD, Purdue University. Systems integration; computer-aided process modeling; product design and manufacturing; industrial control and automation; artificial intelligence.

Thomas J. Crowe, assistant professor, PhD, Arizona State University. Strategic manufacturing planning and control; static and dynamic systems modeling; manufacturing data organization, storage and communications; decision support systems: fuzzy number theory.

Wooseung Jang, assistant professor, PhD, University of California at Berkeley. Stochastic processes and modeling, systems reliability, production and quality control of semiconductor manufacturing, queueing and efficiency control of communication networks.

Elin M. Wicks, assistant professor, PhD, Virginia Tech. Manufacturing systems design; production planning and control; engineering economics; scheduling; multi-attribute decision making.

DEGREES: MS and PhD in industrial engineering

COOPERATIVE DUAL DEGREES: MBA and MS in industrial engineering or MHA in health services management and MS in industrial engineering

The graduate program in industrial engineering provides a scholarly environment in which highly qualified, creative students may obtain the knowledge and develop the skills necessary to solve complex industrial, governmental and societal system design problems. These systems are required to operate within increasingly complex constraints, thus requiring the use of sophisticated and creative designs. The industrial engineer responsible for such designs must be capable of applying a broad spectrum of scientific tools if the most effective systems are to be obtained. In industrial engineering, the master of science program is designed to provide a basic understanding of these tools, and experience in the application of these tools in the design process. The doctor of philosophy program is designed to provide the specialized knowledge and skills necessary to develop new tools or methods for solving complex systems design problems. Information on engineering licensure is detailed under **Professional Engineering Registration**.

Acceptance for advisement in the department's graduate programs is available to students with an ABET-accredited undergraduate engineering degree. Engineering graduates who have not taken linear programming, work measurement, linear algebra, statistical quality control or engineering economic analysis must complete 12 hours of additional course work before graduation. Students with baccalaureate degrees in mathematics, physics, chemistry or computer science may be accepted if they have completed 13 hours of calculus, three hours of differential equations and six hours of calculus-based probability and statistics. Several factors are considered in evaluating an applicant's capability, such as overall GPA, grade trends and major area grades. In addition, each applicant is required to take the general test of the GRE and international students must take the TOEFL and TWE.

Laboratory facilities in several major application areas, both within the department and in

the college, support the academic program. Neighboring industries, city, county and state government agencies, local hospitals and nearby large metropolitan centers provide a reservoir of research and design opportunities.

The department has access to the University of Missouri System computing network and the College of Engineering computer network. The department also maintains its own computing facilities for student use. Besides Ellis Library facilities, an excellent collection of mathematical, statistical and engineering books and reference materials are housed in the engineering library and the industrial and manufacturing systems engineering departmental library.

Fellowships, scholarships, and teaching and research assistantships are available to qualified graduate students. These forms of financial assistance are supported by funds made available through state, federal and industrial graduate support programs, and through research grants from various industrial and governmental agencies.

For additional information write or call the Director of Graduate Studies in Industrial and Manufacturing Systems Engineering, E3437 Engineering Building East, Columbia, MO 65211, (573) 882-2692.

MASTER'S DEGREE: Two basic programs lead to the MS degree:

- A 30-credit-hour research-oriented program requiring a thesis and
- A 33-credit-hour design-oriented program requiring a design project.

No foreign language is required in either program.

The master's curriculum is built upon a six-course core common to all master's candidates and a three-course concentration around which students can mold their overall academic effort. The curriculum covers the manufacturing process; operations research; the interface between industrial engineering, the management function, and the fundamentals underlying decision-making processes; and the understanding and application of probability and statistics to engineering and system analysis problems.

In general, students are accepted for advisement in the MS program if their GPA on the last 60 hours of their undergraduate course of study and their overall undergraduate GPA is at least 3.0 (A=4.0). A minimum verbal score of 350 and a minimum quantitative score of 700 on the general test of the GRE also is required of all students. A TOEFL score of 550 and a TWE of 4.5 is required of all international applicants whose native language is not English.

DUAL MASTER'S DEGREE PROGRAMS: The Department of Industrial and Manufacturing Systems Engineering, in cooperation with the College of Business and Public Administration, offers a dual master's degree program for those students who wish to combine the specialized skills of the industrial engineer with the general knowledge of the professional manager. The program was developed in recognition of the fact that solutions to organization problems often require that the engineer's analytical abilities be applied simultaneously with the manager's integrative perspective. This dual program has been carefully structured to provide the necessary academic background to obtain an MS in industrial engineering and an MBA simultaneously, in a minimum amount of time, usually two academic years.

The Department of Industrial and Manufacturing Systems Engineering, in cooperation with the health services management program of the School of Medicine, offers a dual master's degree program to prepare its graduates for careers in the design and administration of health-care delivery systems and organizations. The program was developed in recognition of the highly complex nature of health-care organizations. The program's basic objective is to fuse competencies in health-service management and in health-systems design. The required courses in the industrial engineering program serve as the area of specialization in the health services management program, and the required courses in the health services management program are used as electives in the industrial engineering program. As a result, it is possible for the student to earn an MHA in health services management and an MS in industrial engineering simultaneously.

DOCTORAL DEGREE: Programs are individually tailored to meet students' objectives. However, the MS core courses also form a core common for all PhD programs, which culminate in an original research dissertation.

Only highly qualified students are accepted for advisement in the PhD program. The faculty look for excellence in undergraduate and graduate work, high GRE scores and strong indications of research potential. In general, students are accepted for advisement in the PhD program if they meet the following requirements:

- Must have completed a master's thesis or equivalent before beginning the program.
- Must have a minimum graduate GPA of 3.5/4.0.
- Must submit three letters of recommendation.
- Must have a minimum GRE score of 350 on the verbal portion and 700 on the quantitative portion; have a minimum TOEFL of 550, and a minimum TWE of 4.5.
- Must have compatible research interests or capabilities with a member of the faculty.

The granting of a PhD requires completion of five major requirements:

- A qualifying examination,
- A course of study,
- Comprehensive examination,
- Acceptance of dissertation proposal, and
- Final public defense of the completed dissertation.

Areas for PhD program research include manufacturing systems, production planning and control, mathematical programming, discrete optimization, fuzzy set theory, statistical data analysis and response surface technologies, integrated production systems, material flow systems, stochastic processes, scheduling, quality assurance techniques, facilities design and health-care delivery services. The basic goals of the PhD program are to provide students with a solid understanding of the theoretical bases for the latest tools and techniques of systems analysis and design, an extensive experience in applying these analyses and design tools and techniques, and research experience in the development of new tools or applications of existing techniques to design or analyze problems.

COURSES

Course numbers followed by K are offered through the Coordinated Engineering Program at the University of Missouri-Kansas City.

207—Operations Research Methods (3). Study of quantitative methods necessary for analysis, modeling and design of optimal industrial systems. Prerequisite: CECS 103 and Math 175.

239—Evaluation of Engineering Data (3). Use of statistical methods to aid in analysis and interpretation of simple engineering experiments and surveys; sampling procedures, estimation, testing of hypotheses; linear and nonlinear relationships; introduction to multivariate situations. Prerequisites: 207 and Engineering 132.

258—Economic Studies in Engineering (3). Engineering economy model for evaluating alternatives in design selection, use of system components.

261—Performance Measurement and Ergonomics (4). Design of man-machine systems considering capabilities and limitations of the human component. Method of measuring human performance in man-machine systems; includes lab. Prerequisite: Engineerng 132.

300—Problems (1-4). Supervised investigation in industrial engineering presented in form of engineering report.

301—Topics in Industrial Engineering (3). Current and new technical developments in industrial engineering.

337—Reliability I (3). Use of Boolean algebra in design and analysis of complex engineering systems; reliability of system in terms of component reliabilities; poisson process as basic failure model; life testing techniques; maintainability; reliability demonstration procedures. Prerequisite: 239.

340—Experimental Design (3). Principles and procedures of design and analysis of engineering experiments and sampling surveys. Prerequisite: 239.

349—Engineering Quality Control (3). Analysis of quality in manufacturing; design of quality control systems using statistical and other engineering methods. Prerequisite: 239.

351—Facility Layout and Material Flow (3). Modeling and analysis of structural and operational issues associated with material-flow system design from both micro- (plant layout, material handling, storage) and macro- (facility location, supply chain) perspectives. Prerequisites: IMSE 387, 388.

371—Applied Robotics in Production (3). (same as MAE 371). Robot structures, arm geometry, drive systems, end effectors, work station design, management aspects, economic factors, applications in various industries. Prerequisites: IMSE 207, 261 and Engr 85.

372—Computer Aided Design and Manufacturing (3). CAD/CAM. Product realization process from geometric/topological modeling, process planning, manufacturing. Including concurrent engineering, design for assembley, group technology, and numerical control. Prerequisite: IMSE 349, 385. Co-requisite: 398.

380—Capstone Design I (2). Combination of case study and industry based problems, each structured to integrate material presented in several theory or methods courses. Prerequisite: 388. Co-requisite: 351, 372, 398.

381—Capstone Design II (2). Industry-based design problem structured to integrate material presented in several theory or methods courses. Must immediately follow IMSE 380. Prerequisite: 380.

383—Management Information Systems Design (3). Information flow and management theory, output design, financial information, data structures and process methods,

database management systems, information modular design, artificial intelligence, hardware and telecommunications considerations. Prerequisite: CECS 103, IMSE 258. Co-requisite: IMSE 398.

384—Computer Integrated Manufacturing Control (3). Implementation of computer integrated manufacturing at the shop floor level. Covers machine sensing and actuation control, information representation and processing, data communications and networking. Prerequisite: Engr 124, IMSE 372, 383. Co-requisite: IMSE 371.

385—Manufacturing Systems Design (3). Design project involving development, analysis and comparison of alternate methods of manufacturing a product; extensive survey of a variety of manufacturing methods is included. Prerequisites: Chemistry 31 and Engineering 85.

387—Linear Programming (3). Theory and application of linear programming. Prerequisite: 207.

388—Industrial Systems Simulation (3). Dynamic modeling of discrete-event stochastic systems using general-purpose and specialized programming languages. Statistical design and analysis of simulation-based experiments including distribution fitting and alternative comparison methodologies. Prerequisites: IMSE 239, 397. Co-requisite: IMSE 261.

397—Operations Research Models (3). Formulates probabilistic models and determines optimal control policies for queueing and inventory systems. Introduces Markov chains and dynamic programming. Prerequisites: Engr 132, IMSE 207.

398—Scheduling Systems (3). Quantitative methods for forecasting, scheduling, and controlling production in complex manufacturing systems. Prerequisite: 387, 388.

400—Problems (1-99). Supervised investigation in industrial engineering to be presented in the form of an engineering report.

401—Advanced Topics in Industrial Engineering (3). Current and new technical developments in industrial engineering.

404—Industrial Engineering Graduate Seminar (1). Selected topics in industrial engineering; oral presentations and engineering reports.

415—Advanced Economic Studies in Engineering (3). Theoretical basis for engineering economy methods, problems of parameter estimation, depreciation, and replacement studies. Prerequisite: 258.

421—Strategic Enterprise Management (3). Topics including enterprise stategies, process and content models, strategy implementation, value chain analysis, business processes, systems engineering approaches, business process reengineering, and dynamic systems modeling.

431—Stochastic Service Systems (3). Development and application of stochastic models in the design of service systems in which either demands for service or services supplies, or both, have a probabilistic nature. Prerequisite: Statistics 320, Statistics 325 or equivalent.

437—Reliability II (3). Development and application of quantitative models for planning and evaluation of the performance of engineering systems. Prerequisite: 337.

439—Quality Control Systems (3). Advanced process control charts, empirical model-building, fractional factorial designs and Taguchi techniques as tools for process and product improvement, professional ethics in quality management; TQM and ISO 9000. Prerequisite: IMSE 349, 440.

440—Advanced Evaluation of Engineering Data (3). Application of advanced statistical methods for the analysis of engineering design and experimental problems. Prerequisite: 239.

451—Advanced Material Flow Systems (3). Advanced study and modeling of the design and operation material flow systems, including facilities design, material handling, inventory and warehousing issues; application of optimization and simulation techniques. Prerequisties: 351, 387, 388.

470—Operations Research-Discrete Models (3). Applications of discrete operations research methods, including linear programming, fuzzy sets, integer programming, and meta-heuristics. Prerequisite: 387.

471—Operations Research-Stochastic Models (3). Theory and applications of stochastic processes; includes continuous time Markov chain, Markov decision process, queueing theory, and stochastic manufacturing systems. Prerequisite: 397.

472—Nonlinear Optimization (3). Introduces computational non-linear mathematical programming procedures their use in solving complex industrial systems design problems. Prerequisite: 387.

475—Inventory Control Systems (3). Design of optimal inventory control systems; includes selection of operating doctrine, development of several deterministic, stochastic, static and dynamic models and methods of collecting appropriate demand and cost data. Prerequisites: 239, 387.

480—Linear Programming Applications (3). Theory and computational method of the simplex algorithm; application of linear programming in solution of transportation problems, competitive games, scheduling problems, and product mix problems.

483—Advanced Management Information Systems Design (3). Develops requirements for management information, staffing, cost estimating, evaluation, and the design of management communication systems; includes case studies. Prerequisite: 383.

484—Dynamic Programming (3). Introduces theory and computational aspects of dynamic programming; its application to sequential decision problems. Prerequisites: 239 and 387.

485—Advanced CAD/CAM (3). Covers the state-of-the-art in CAD/CAM and explores the latest developments, residual problems, and new direction in CAD/CAM. Includes sculptured surface modeling, rapid prototyping and manufacturing, integrated process planning, shape analysis, machine intelligence. Prerequisite: IMSE 372.

486—Advanced Integrated Production Systems (3). Advanced study of the design and operation of flow shop, job shop, and cell-based production systems, including scheduling, layout and material flow issues. Prerequisites: 351, 372, and 398.

487—Advanced Linear Programming (3). Advanced study of linear programming, including revised simplex, duality, primal-dual methods, capacitated transportation problem, decomposition principle and introduction to quadratic programming; interior point methods. Prerequisite: 387.

488—Integer Programming (3). Comprehensive appraisal of integer programming problem and current solution procedures. Prerequisite: 387.

490—Research (1-99). Independent investigation in field of industrial engineering to be presented as a thesis. Graded on S/U basis only.

Information Science and Learning Technologies

School of Information Science and Learning Technologies
College of Education
20 Rothwell Gym (573) 882-4546
http://www.coe.missouri.edu/~sislt/

FACULTY

John Wedman, director, associate professor, PhD, University of Oklahoma.

Bryce Allen, director of graduate studies, associate professor, PhD, University of Western Ontario.

MaryEllen Sievert, professor, PhD, University of Missouri-Columbia.

John M. Budd, associate professor, PhD, University of North Carolina-Chapel Hill.

Gail Fitzgerald, associate professor, PhD, University of Iowa.

Francis J. Flood, associate professor emeritus, AMLS, University of Michigan.

Thomas R. Kochtanek, associate professor, PhD, Case Western Reserve University.

James Laffey, associate professor, PhD, University of Chicago.

Linda Esser, assistant professor, PhD, University of Kentucky.

Kyung-Sun Kim, assistant professor, PhD, University of Texas at Austin.

Joi Moore, assistant professor, PhD, University of Georgia.

Dale Musser, research assistant professor, PhD, The Ohio State University.

Michael Wright, assistant professor, EDD, University of Illinois.

DEGREES: The emphasis areas available in the Information Science and Learning Technologies program include: MA: Library Science; MEd & Ed Sp: Educational Technology; PhD: Instructional Theory and Practice.

MASTER OF ARTS IN LIBRARY SCIENCE: The mission of the library and information science program is to transform thought and, through thought, action in libraries and information environments. The program seeks to accomplish this mission by three means: through the education of students, by conducting and interpreting inquiry, and by participation and leadership in professional and disciplinary associations. Implicit in this mission is the imperative of education and inquiry based on the content, users, and media (technologies) of information, with access being central to all activities.

Goal 1. Create an environment for the development of the students' knowledge base, rooted in the theoretical foundation of the discipline within the context of a user-centered approach to professional practice.

Goal 2. Extend the knowledge base of library and information science and its application through research, outreach, and scholarship centered around the interaction among and access to content, media, and users.

Goal 3. Provide leadership in the state and nation to define essential questions and solve critical problems in the discipline of library and information science.

A student's program consists of required and elective coursework, observational and practical experiences, and opportunities to work as a member of a research and development team. Students seeking certification as a school librarian/media specialist need to meet the certification requirements in place at the time of graduation.

Program Accreditation: American Library Association

MASTER OF EDUCATION AND EDUCATIONAL SPECIALIST IN EDUCATIONAL TECHNOLOGY: The purpose of the Master's and Educational Specialist Degrees in Educational Technology is to prepare educators and

technologists for excellence and leadership in the design, development and implementation of technology in educational and training settings. We seek individuals who are committed to lifelong learning and who aspire to use advanced technology to improve education and training.

The field of educational technology is dynamic and wide-ranging. Graduates of the program will find opportunities to use their knowledge and competencies as classroom teachers, media specialists, district technology specialists and coordinators, designers and developers of technology-based learning applications, training specialists for businesses, medical settings, and public institutions, as well as other creative positions.

The student's work in the program encompasses three competencies and focuses on producing exemplary products to demonstrate knowledge and mastery of the competencies. The three competencies are: Planning & Designing; Developing & Building; and Implementing, Managing, & Evaluating. Both the Master's and the Educational Specialist program consist of producing these products through course work, independent study, and practicum experiences. While course work supports the student's success with these products, we encourage all students to develop the products across time in the program, so that the products are personally satisfying, solve real problems, and represent high quality work. These products are then organized in a portfolio of accomplishments that is used to assess the student's knowledge and skills. We encourage students to work cooperatively, as well as to expand their network of colleagues beyond our program and our campus.

DOCTOR OF PHILOSOPHY: The PhD program prepares professionals to understand and influence learning, information, and performance in diverse settings, especially through the use of interactive technologies. We seek individuals who are committed to conducting research that integrates theory and practice.

Our graduates possess the competencies required to:

- Analyze specific informational organization and retrieval, learning, and performance needs and evaluate systems to meet these needs.
- Design, develop, and implement technologies and technological interventions to improve information organization and retrieval, learning, and performance.
- Conduct systematic research, which contributes to the knowledge base of learning, information organization and retrieval, performance, and /or technology.

Course work, internships, and independent study projects support the achievement of these competencies. A student's program centers on producing a portfolio of achievements indicating that the competencies have been attained. While course work supports production of the portfolio, we encourage students to develop products that cut across several courses, resulting in products that are personally satisfying, solve real problems, and represent high quality work. We are particularly interested in products developed in collaboration with other students, practicing professionals, and others beyond our program and campus.

The program culminates with a significant research effort that contributes to the knowledge base of learning, information organization and retrieval, performance, and/or technology. Whether one major study or a series of smaller studies, the research is designed to position our graduates along side the leading theorists, researchers, and practitioners in the field.

See **EDUCATION** for general information.

GENERAL ADMISSION POLICY: The school requires the following materials from the applicant: 1) Supplementary Application Form; 2) three letters of recommendation; 3) a recent score report from either the Graduate Record Examination (GRE), or the Miller Analogies Test (MAT); and 4) an official transcript of all previous course work.

Beginning Fall semester 2000, the MAT will no longer be accepted for the MA in Library Science degree program.

For applicants whose first language is not English, a score of 540 or better on the TOEFL is preferred.

Only students whose academic records indicate probability of successful completion of the program are accepted for advisement. In general, a GPA of 3.0 (A=4.0) on the last two years of undergraduate work and a satisfactory score on the GRE or MAT is required. The applicant's total credentials, including letters of reference, other post-baccalaureate work, experience, or other factors, however, determine admission. Those students who do not meet the minimum GPA may be admitted on probation and must, then, achieve and maintain a minimum GPA of 3.0 during their graduate careers.

COURSES

Q301—Introduction to Information Technology (3). The nature of information and information transfer in the institutional setting; covers the culture of information in society, standards for information processing and transfer, and networking in communications perspectives of information providing agencies.

Q302—Organization of Information (3). An overview of the research that addresses information-seeking behavior and the history, background, and development of catalogs and indexes.

Q303—Information Services and Society (3). Exploration of the relationship between libraries and society, libraries' communities, the philosophical and organizational aspects of the profession, and the nature of information and information transfer.

Q310—Seminar (1-3). Discussion and critical study of current developments in the field of information science and learning technologies.

Q311—Abstracting and Indexing (3). Representational components of information systems presented in context; emphasizes creation of abstracts, and characteristics and use of post-coordinate indexing languages. Practical experience in use and evaluation of indexing systems stressed. Prerequisite: departmental consent. f, alt. s.

Q312—Principles of Cataloging and Classification (3). Elementary cataloging of library materials using Dewey Decimal Classification and Library of Congress classification with emphasis upon subject headings, also looking at other existing classification schemes presently being used and other bibliographic organization. f,w,s.

Q313—Managing Collections and Access (3). Selection of materials for libraries and information agencies, policies for collection management, freedom and diversity of information, access to information and evaluation of collections and access.

Q314—Reference Sources and Services (3). General reference sources with emphasis on print sources. principles, developments and trends in reference services and reference service organization.

Q315—Management of Information Agencies (3). Concepts of management applied to libraries and information systems; management tools, programming, models and simulation in an environment of an information producing or disseminating agency. f,w, alt. s.

Q316—The Administration of School Libraries/Media Centers (3). (same as Curriculum & Instruction T378). Purposes, objectives, functions and activities of the school learning resource center; qualifications of personnel; physical facilities; standards. w,s.

Q320—Introduction to Archives and Manuscripts (3). (same as History 374). Introduction to value and use of archives and manuscripts, to develop awareness of the unique role of archives and manuscript repositories as information resources; concepts, terminology, and archival principles. w,s.

Q321—Library Materials for Children and Youth (3). Background of library materials for children; psychology of children, youth; characteristics in use of print, nonprint material; current publishing trends. Reader's guidance, book talks, resources, story-telling resources. f.

Q327—Preservation and Restoration (3). Theoretical and practical with archival and manuscript materials, rare books, and media; concerned with methods and materials for preservation and restoration. f, alt. s.

Q334—Library Information Systems (3). Focuses on the automated library systems marketplace. Covers integrated online library systems from the systems, functional and user perspective. Includes management approaches for procurement and operation of such systems.

Q335—Introduction to Information Science (3). Generalized theories and concepts regarding the flow of information in systems such as libraries and related information agencies. Focus on technical, semantic and behavior characteristics of information transfer.

Q336—Information Networks and Telecommunications (3). Addresses design, implementation and usage issues associated with local area and wide area networks provided for accessing bibliographic text, full text, and graphical information forms.

Q338—Local Area Network Applications (3). The application of high speed proprietary network schemes connecting personalized workstations. Focus on establishment, operation and management of such in-house connectivity solutions.

Q350—Special Readings (1-99). Prerequisites: departmental consent.

Q351—Library Research in Special Areas (1-99). Reference sources and bibliographic aids in various disciplines studied on an individual basis by actual use in performance of research under direction of assigned faculty instructors. f,w,s.

Q377—Foundations of Educational Technology (3). Study of theories and practices associated with educational technology. Includes the analysis, design, evaluation, implementation, and management of educational technology hardware and processes. Prerequisites: teaching experience or instructor's consent.

Q380—Practicum (1-3). Supervised work in a school, public, special, or college library. Prerequisite: departmental consent. Letter grading only. f,w,s.

Q400—Problems (1-99). Independent, directed study on a topic in the field of library science. Prerequisites: graduate standing; departmental consent. f,w,s.

Q402—Advanced Cataloging (3). Descriptive and subject cataloging of print and non-print serials, manuscripts, and

archival materials, using the Dewey Decimal and Library of Congress classification systems and the Library of Congress subject Headings. Prerequisite: 312

Q403—Classification Theory (3). A seminary course that is an in-depth study of the history and the theories and concepts underlying the development of classification systems as means of subject access to users. Prerequisite: 312 or 311.

Q404—Technical Services (3). Seminar course that provides an examination of the theories and practice of the bibliographic control and organization of materials and an examination of management issues in technical services departments. Prerequisite: 312.

Q405—Multimedia Production (3). Exploration of the components of multimedia production will be a focal point of this course. The study and research of various authoring programs and multimedia software will be utilized to create multimedia products.

Q406—Integration of School Library Media Programs/ School Curriculum (3). Integration of the school library media into the school curriculum will focus on building collaborative coalitions between the library media specialist and the classroom teacher. Students will design resource-based learning models.

Q407—Communication Theory & Practice in Libraries (3). Analysis and discussion of communication research applications in libraries, including aspects of organizational, interpersonal, and intercultural communication. Assessment of the impact of technological medication on information seeking, information provision, and independent learning.

Q408—Information Policy (3). Examination of the roles of private and public sectors in information policy formation. Includes consideration of social, economic, political and technological issues.

Q409—Trends and Issues (3). Identification, analysis, and discussion of implications of emerging trends in information services as well as recurrent themes and issues in information access. A seminar course; requires departmental consent.

Q410—Seminar in Library Science (1-3). Discussion and critical study of current developments in library science. Prerequisites: admission to candidacy for master's degree in Library Science or departmental consent. f,w.

Q411—Networked Resources and Applications (3). Explores the current status of evolving network information resources developed at the Federal and State Levels seeded by public funds. Focus is on graphical client applications that support access to digital library information stored on remote servers. Prerequisite: 301.

Q412—Information Storage and Retrieval (3). Introduces students to concepts and terminology associated with the storage and retrieval of bibliographic information. Emphasizes design of applied database management systems. Prerequisite: departmental consent. w.

Q416—Information Resources in Health Sciences (3). Emphasizes medical terminology and the transfer of health related information. Students are exposed to traditional and electronic information resources as they actively respond to real and simulated information requests.

Q420—Information in the Disciplines (3). Provides an understanding of how and why information is produced, stored and communicated in various intellectual disciplines. Students evaluate examples of these activities in specific disciplines.

Q422—Information Systems: Design and Evaluation (3). A study of new and traditional principles of systems design. A variety of evaluation methods will be explored and applied to a newly developed system. Prerequisite: Q334.

Q425—Government Publications (3). Survey of publications of municipal, state, United States, and international government units. Special attention given to principles and techniques of administering a public documents collection. f, alt. s.

Q426—Multimedia Resources of Libraries (3). Selection, acquisition, evaluation, organization, and utilization of non-book materials in varying types of libraries: exploration of issues relating to storage, circulation, cooperative ownership, and user needs with special attention to creative multimedia program development. alt. s.

Q428—The History of Books and Printing: The Printed Book (2-3). Prerequisites: departmental consent. w.

Q430—Computer Applications in Health Services (3). (same as Health Services Management 430). Examines clinical research and administrative applications of the computer in health services delivery. Provides an introduction to medical informatics. Prerequisite: appropriate class in computer methods or instructor's consent.

Q432—Automated Reference Services (3). General summary of available systems and their characteristics; particular emphasis on those available to the general library community. Machine searching experience with major brokers provided. Prerequisite: Q301, Q314 and departmental consent.

Q433—Services to Children (3). Collection development, organization of children's services, preschool activities, relations with the school library, story-telling techniques. w, alt. s.

Q435—Adult Services in Libraries (3). Library services to adults, including special populations. Emphasis on information needs of adults, organization and management of adult services.

Q436—Legal Bibliography and Reference (3). Teaches the basic sources and methodologies in legal research. The LEXIS and WESTLAW systems are also explored.

Q442—Law Library Administration (3). A seminar course covering a variety of topics connected with law librarianship including management (governance, personnel, budget, space), acquisitions (including legal publishers and law book distributions) and technical services (cataloging, computing services).

Q443—The Academic Library (3). Development, objectives, organization and structure, nature of the collections and responsibility for their development, philosophy of library services, measurement and standards of library effectiveness. w, alt. s.

Q444—The Public Library (3). Objectives, relations with other institutions, scope of library services, public relations, standards. w, alt. s.

Q445—Special Libraries and Information Centers (3). Goals of special librarianship including information provision, management styles. Library functions as performed in special libraries. Contributions of special libraries, such as information analysis centers, information brokering, and accountability for and evaluation of services. w, alt s.

Q447—Archives Administration (3). (same as History 413). Principles and concepts of archival/manuscript techniques and administration of archival agencies and manuscript repositories. Includes legal and sociological implications of archival theory and practice. f, alt. s.

Q449—History of Libraries (3). Development of libraries and library services from ancient times to present; role of libraries in different times, societies; identification of problems faced by librarians, analysis of solutions. w, alt. s.

Q450—Research (1-99). Examination of research methodologies applicable to library and information phenomena, including the defining of research problems and their contexts. Prerequisite: departmental consent.

Q451—The Biomedical Community (3). Survey of the backgrounds and expertise of different health professionals; organization, costs and payment of health care in the biomedical community. f, alt. s.

Q471—Instructional Systems Design (3). Development of skills and knowledge related to the systematic design of instruction. Emphasis is placed on content analysis, instructional strategies, and formative evaluation. Prerequisites: course in Curriculum or Instruction or instructor's consent.

Q472—Review of Research in Educational Technology (3). Examination of research related to the design, development, use, and evaluation of educational technology software and processes. Prerequisites: Q471 or instructor's consent.

Q475—Diffusion of Educational Innovations (3). In-depth analysis of innovation development and adoption processes in educational organizations, including schools, universities, and training centers.

Q480—Internship in Information Science and Learning Technologies (1-99). Provides internship experience under supervision in advanced levels of practical experience in Information Science and Learning Technology Research and Teaching. Prerequisite: School director's consent. Graded on S/U basis only.

Q490—Research in Information Science and Learning Technologies (1-99). Dissertation research. Prerequisite: Doctoral Committee Chair's consent. Graded on S/U basis only.

International Development

FACULTY

Corinne Valdivia, director, research assistant professor of agricultural economics, PhD, University of Missouri.

This interdisciplinary minor is available to any graduate student interested in studying Third World development. The minor requires 12 semester hours and program approval by the director.

Students interested in learning more about this minor should write or call the Director of Graduate Studies in International Development, 213B Mumford Hall, Columbia, MO 65211, (573) 882-4020.

Journalism

School of Journalism
116 Walter Williams (573) 882-4852

FACULTY

R. Dean Mills, dean, professor, PhD, University of Illinois.

Esther Thorson, associate dean, professor, PhD, University of Minnesota.

Judith Bolch, professor, MA, University of North Carolina-Chapel Hill.

Brian S. Brooks, professor, MA, University of Missouri-Columbia.

Glen Cameron, professor, PhD, University of Texas-Austin.

Won H. Chang, professor, PhD, University of Iowa.

Roger A. Gafke, professor, MA, University of Missouri-Columbia.

George Kennedy, professor, PhD, University of Missouri-Columbia.

Edmund B. Lambeth, professor, PhD, American University.

Robert A. Logan, professor, PhD, University of Iowa.

Stuart Loory, professor, MS, Columbia University.

Daryl R. Moen, professor, MA, University of Minnesota.

Donald P. Ranly, professor, PhD, University of Missouri-Columbia.

Keith P. Sanders, professor, PhD, University of Iowa.
Byron T. Scott, professor, MA, University of Miami.
Lee Wilkins, professor, PhD, University of Oregon.
Betty Winfield, professor, PhD, University of Washington.
Danita Allen, associate professor, MA, University of Missouri-Columbia.
Mary Kay Blakely, associate professor, MA, Northern Illinois University.
Phillips Brooks, associate professor, MA, University of Missouri-Columbia.
Jan Colbert, associate professor, MA, University of Missouri-Columbia.
Sandra Davidson, associate professor, PhD, University of Connecticut-Storrs.
Bill Kuykendall, associate professor, MA, University of Minnesota.
Michael McKean, associate professor, MA, Rice University.
Wes Pippert, associate professor, MA, Wheaton College.
Zoe Smith, associate professor, PhD, University of Iowa.
Birgit Wassmuth, associate professor, PhD, University of Minnesota.
Steve Weinberg, associate professor, MA, University of Missouri-Columbia.
Dwight Williams, associate professor, PhD, The Ohio State University.
Ann Brill, assistant professor, PhD, University of Minnesota.
Frederick W. Cropp, assistant professor, PhD, University of Missouri-Columbia.
Lillian Dunlap, assistant professor, PhD, Indiana University-Bloomington.
Cynthia Frisby, assistant professor, PhD, University of Florida.
Glenn Leshner, assistant professor, PhD, Stanford University.
David Rees, assistant professor, MA, University of Missouri-Columbia.
Kurt Wildermuth, assistant professor, MA, University of Missouri-Columbia.
Barbara Zang, assistant professor, PhD, Indiana University.
Lynda Kraxberger, instructor, MA, University of Missouri-Columbia.

DEGREES: MA and PhD in journalism

A variety of special facilities and resources are available to help students meet their objectives. The *Columbia Missourian,* a general circulation daily newspaper with full-leased wires of The Associated Press and The New York Times Service, KOMU-TV, an NBC affiliate, KBIA-FM, a National Public Radio station and *Missouri Magazine* provide students the opportunity to "learn while doing" under faculty supervision and to conduct applied research.

The Journalism Library subscribes to more than 200 newspapers and magazines worldwide and catalogs more than 30,000 volumes. The State Historical Society of Missouri on campus has an extensive collection of state newspapers dating from 1808.

The Freedom of Information Center maintains a day-to-day study of the actions by government, media and society affecting the movement of information. The national headquarters of Investigative Reporters and Editors provides educational services to reporters, editors and others interested in investigative journalism. The National Institute for Computer Assisted Reporting provides consultation and training to news organizations throughout the U.S. New Directions in News, a think-tank dedicated to increasing the impact, effectiveness, readership and appeal of American newspapers, is a clearinghouse for ideas and a resource for research.

The Service Journalism program based in the magazine sequence focuses on how to effectively provide information to consumers and offers workshops for professionals, covering such topics as health and nutrition, travel, science and minorities coverage. The Science Journalism Center offers data base searches, a clipping service, abstracts of articles in topic areas and copies of original stories for a fee, and serves as a source of referrals for reporters interested in health topics. The Center for Advanced Social Research provides survey and other services to a broad variety of governmental, corporate, and media organizations. It employs more than 50 graduate students from around the MU campus. The Stephenson Research Center is the home of advanced academic and professional research. The Graduate Computing Center, which is part of the journalism school's state-of-the-art computer system, provides data-processing facilities and assistance.

Each year the school sponsors Journalism Week, which brings contemporary leaders in mass communications to the campus. The school also directs a number of professional development and awards programs, including the international competition for the best Pictures of the Year.

Kappa Tau Alpha, national honor society for scholarship in journalism founded at the University in 1910, has its headquarters in the school.

Several fellowships, assistantships, scholarships and other financial aid opportunities are available. Applications for journalism fellowships and scholarships must be received by Feb. 1 for the following year.

For details, write to the Associate Dean of Graduate Studies, School of Journalism, 116 Walter Williams Hall, Columbia, MO 65211.

MASTER'S DEGREE: The program leading to the MA degree is designed to accommodate several objectives, including: comprehensive professional preparation for careers in the news media and mass communications; expansion of previous professional preparation and experience (newspaper editing) into a new area (broadcasting reporting); comprehensive academic preparation for careers in journalism teaching and research; and combinations of the three.

Applicants must submit an application for graduate admission, transcripts, a completed Journalism Master's application, three letters of recommendation and GRE general test results. Minimum standards for acceptance include an undergraduate GPA of 3.0 (A=4.0) and a verbal/quantitative GRE total of 1000. If the GPA (cumulative or last 60 hours, whichever is higher) is between 3.0 and 3.2, the GRE score must be at least 1100. Some students may be required to take courses to correct deficiencies in their undergraduate studies.

Students must complete undergraduate courses in news and editing or their equivalent as determined by the admissions committee. Students who verify professional experience may be excused from these requirements with permission from the associate dean for graduate studies.

Deadlines for application are February 1 for fall and summer entry and September 1 for winter. Deadlines are adhered to strictly, and no applicant is considered for admission until all required information is received.

International applicants must have a TOEFL score of at least 600. For information about requirements and deadlines for 1-20 forms, or visas, write the International Center, N52 Memorial Union, Columbia, MO 65211.

Students choose from 13 program models: advertising, broadcast news, design, editing, environmental reporting, international, magazine, media management, new media, news media and society, photojournalism, public policy and reporting/writing. Students must complete all course requirements in the selected model and complete either a thesis or a professional project. On occasion, students may develop an individually structured program to prepare for specific career objectives.

Students interested in public affairs reporting may choose to complete a professional project in an off-campus program. The Washington program, directed by a full-time faculty member, is housed in the National Press Building in Washington, D.C. Students who qualify for the program need strong foundations in American and world history, economics and political science. They report on legislative, executive and administrative aspects of the national government. Students interested in special coverage of state government and related agencies are supervised by a faculty member at the school's bureau in the Missouri State Capitol Building. Off-campus programs also are available by special arrangement elsewhere.

Students are required to complete a minimum of 37 to 41 hours (depending upon area of specialization), at least half of which must be in 400-level courses. Specific course requirements vary depending on the option selected. MA candidates are required to produce a portfolio containing creative and integrative work accomplished in each course taken in the Journalism School for graduate credit. Students must enroll in either the Project Seminar or the Thesis Seminar and develop proposals for their professional project or thesis. During the Project or Thesis Seminar, they must also write an "integrative introduction," which discusses the interconnections among the courses they have taken, and provides a rationale for the combination of courses that compose the degree.

DOCTORAL DEGREE: The objective of the doctoral program is to develop an ability to conduct independent and advanced scholarly research and to integrate this skill with a depth of scholarship in journalism and mass communication. Although it is primarily a research degree, the PhD is designed to facilitate a variety of academic aims. Students must expand their intellectual horizons, gain a theoretical framework for examining and understanding communication, and refine their own communication competencies.

Doctoral study in journalism and mass com-

munication is an interdisciplinary enterprise. The doctoral program is designed by the student in collaboration with the adviser and doctoral committee. Course selections are based on the intellectual requirements of the dissertation and the teaching areas the student wishes to pursue. No courses that focus primarily on professional skills may be counted toward the doctoral program, whether taken at the master's or the doctoral level. Courses from journalism should compose no more than two-thirds of the total credit. Students must develop two research tools, submit and defend a dissertation, pass qualifying and comprehensive examinations and satisfactorily meet all other requirements of the Graduate School. Mass Media Seminar (401), Research Methods (408) and Advanced Research Methods (458) are required of all PhD students.

For admission, students must submit an application for graduate admission, copies of all transcripts, a School of Journalism doctoral application and Graduate Record Examination general test scores. A minimum GPA of 3.5 (A=4.0) in graduate work and 3.0 in undergraduate courses is required. Applicants must meet a minimum GRE standard of 1100 for the verbal and quantitative parts combined. A minimum of two years of full-time professional media experience is required (college-level teaching does not meet this requirement). Either the bachelor's degree or the master's degree must have been earned in journalism or mass communications. International applicants must have a TOEFL score of at least 600. All required information must be received before the admission review can begin. Applicants may be required to participate in an interview with the doctoral faculty as part of the review process. Students who did not write a thesis in their master's program will be required to complete a project to demonstrate their ability to do independent research.

Students are expected to have a background in a foreign language and to develop a research tool. The language requirement may be met by three semesters of college-level foreign language courses or an equivalency acceptable to the doctoral faculty. At the discretion of the student's doctoral committee and the associate dean for graduate studies, a second tool may be used to substitute for the language requirement. There are four research tool options: (1) competency in a second foreign language. This may be satisfied by two years of college-level work recently passed with a grade of C or better or an acceptable ETS score. A foreign language is one that is non-native or not the primary language used in the student's school system; (2) computer proficiency as evidenced by completion of two computer courses or an equivalency acceptable to the doctoral faculty; (3) two courses in statistics; (4) two 300- or 400-level research methods courses outside the School of Journalism. A grade of A or B must be made in any course used for options 2, 3 or 4.

Doctoral students will participate in a teaching program. Each student's teaching skills will be evaluated in Doctoral Seminar at which point planning for the student's future teaching opportunities begins. Most students will take the doctoral teaching seminar during their third semester in the program as well as serve as teaching assistant in such classes as J200, J304, or J309. In the student's fourth semester, he/she would have an additional teaching experience, either as teaching assistant, co-instructor or instructor of record in a course. Depending on the student's ability and desire, students might teach a course independently during later semesters.

Students are admitted to the PhD program in journalism when they have passed the doctoral seminar (qualifying examination), which must be taken the semester in which the student **completes** 18 hours. Graduate School regulations about comprehensive examinations, dissertations, plans of study, residency and other matters are specified in the **Degree Requirements** section of the catalog.

COURSES

200—Principles of American Journalism (3). Introductory course designed to acquaint students with concepts and functions of journalism in American society. Stresses the basic issues and problems facing journalists and the mass media. Prerequisites: English 20, sophomore standing.

301—Topics in Journalism (1-3). Selected current topics in journalism. Specific topics to be announced at time of registration.

302—Cross-Cultural Journalism (3). Cross-Cultural Journalism provides journalistic tools for the coverage of diverse ethnic, gender, ability and ideological groups inside and outside the United States. The critical role of diverse voices in a democracy will be discussed. Prerequisites: Magazine and News-Editorial students should take 302 concurrently with 306. Photojournalism students should take concurrently with either 306 or 342. Broadcast News students should take concurrently with 350. Advertising students should take 302 in their junior year.

303—Solving Practical Problems in Journalism (3). Finding solutions to practical problems journalists face by applying insights from communication theory, using on-line secondary and syndicated research, and conducting original research. Hands-on experience conducting surveys, experiments and qualitative research. Prerequisites: Journalism 105 and 200 and junior standing. Students should take this course in their first or second semesters in the School of Journalism.

304—Communications Law (3). Legal concepts, including prior restraint, libel, privacy, obscenity, contempt and access, as they relate to print, broadcast, advertising and other areas. f,w.

305—Critical Reviewing (3). A combination of theory and practice that covers the philosophy and craft of reviewing the arts, including books, movies, television, dance, painting, sculpture and architecture. Students must attempt to publish reviews and essays locally, regionally and nationallly. Reviews published in Sunday Magazine. Prerequisites: 104 or 105 and instructor's consent. f.

306—Reporting (3). Assignments on a daily city newspaper covering community news, city, county and state affairs, sports and lifestyle issues. Experience in gathering and writing news, writing under deadline conditions. Prerequisites: 104 or 105. f,w,ss.

307—Advanced Reporting (3). Assignments to more difficult beat areas, team reporting, and some investigative reporting for community newspaper. Individual conferences and weekly class sessions on contemporary reporting problems. Prerequisite: 306.

308—Law and the Courts (2). Lectures, readings, discussions, writing assignments relating to justice system reporting from the view of attorneys, prosecutors, judges, correction and probation officers, with the cooperation of the Missouri Bar. Prerequisites: 104 or 105. f,w.

309—History of American Journalism (3). American mass media from colonial days to present in the context of social, economic and political change. f,w.

310—Newspaper Editing (3). Laboratory work on the Columbia Missourian plus lectures on ethics, page design and news decision making. Prerequisite: 110. f,w,ss.

311—Advanced Newspaper Editing and Design (3). Continuation of desk editing with emphasis on page design, graphics and typography. Prerequisite: 310, 363 or instructor's consent.

314—Computer-Assisted Reporting (3). How to negotiate for, transfer and process electronic information; the unique opportunities computers provide for analyzing information. Prerequisite: permission from instructor.

315—Reporting of Public Affairs (3). Advanced course designed to acquaint reporters with public issues. Students write two in-depth projects and other shorter assignments. Students meet weekly with instructor for editorial suggestions. Prerequisites: 306 and instructor's consent. f.

316—Science Writing (3). Advanced course reporting science, medicine and environment. Write for publication. Prerequisite: 306 and instructor's consent. f.

317—Women and the Media (2). (same as Women Studies 317). Focus on portrayal of women in American mass media. Other goals: historical perspective on women as journalists; exposure to issues usually not covered by mass media; research and writing skills. Prerequisite: instructor's consent.

318—Introduction to Selling for the Mass Media (3). Function of media sales in society. Sales techniques including psychology of selling, use of research, cooperative advertising and client service. Practice in making sales presentations. Prerequisites: 120 or 336. f,w.

320—Editorial Writing (3). Emphasizes writing and thinking. Discussion of current problems. Correct and effective use of English language. Mission, obligations and history of editorial pages. Students write editorials for the Columbia Missourian. Prerequisite: 306. f,w,s.

321—Advertising Copy, Layout and Production (3). Focuses on developing print and broadcast ads that produce results, with due attention given to the criteria analysis of advertising problems and the development of a creative strategy. Prerequisites: 120, 333, and 336. f,w.

322—Psychology in Advertising (3). Application of psychological principles, learning, perception, motivation, attitudes to advertising. Emphasis on the increasing use of psychographics (the "lifestyle "factor) to understand consumer wants and buying behavior. Prerequisite: advertising core courses. f,w.

323—Advanced Media Sales (3). Professional sales techniques, account service, advertising production, cooperative advertising, offset techniques, market data. Students assigned retail and classified accounts for which they will prepare, service and sell advertising. Prerequisites: advertising core courses. f,w,s,ss.

324—Advertising and Public Relations Campaigns (3). Marketing-oriented approach to the total campaign. Interrelates managerial, creative and technical skills with emphasis on problem-solving and marketing communication. Prerequisites: advertising core courses to be taken final semester. f,w.

325—Media Promotion (2). Use of promotional tools and methods in relation to specialized promotion of media. Prerequisites: 120. f,w.

326—Broadcast Advertising (3). Broadcast advertising production. Emphasis on equipment, directing, script/storyboard preparation, and commercial analysis. Students become familiar with procedures, techniques and facilities used in basic radio and television production. Prerequisites: advertising core. f,w.

327—Direct and Mail Order Advertising (2). Direct mail advertising and mail order promotion, retail and national; mailing lists, copy, production, postal regulations, strategy. Prerequisite: advertising core courses. f,w.

328—Retail Advertising (2). Basic concepts of marketing, advertising, merchandising, and salesmanship, as they apply specifically to the retail firm, the advertising agency handling retail clients, and media retail advertising departments. Prerequisite: advertising core courses. f,w.

329—Creative Strategy and Tactics (3). Advanced course in creation of broadcast, print advertising. Emphasis on strategic planning, developing creative concepts, producing and polishing copy and visuals, execution of finished product, and refining presentation skills. Prerequisite: advertising core courses. f,w.

330—Media Strategy and Planning (3). The course is devoted to producing a national media plan for a client product of the student's choice, using microcomputer software and practical application of media research information sources. Prerequisites: core courses. f,w,s.

331—Advertising Management (3). Methods for gathering, evaluating and organizing material pertinent to the solution of advertising problems. Uses case studies. Prerequisite: advertising core courses. f,w.

332—Public Relations (3). Current methods of dissemination of public information as practiced by business, industrial, educational and social organizations. Strong emphasis on what the public relations practitioner actually does, and why. Prerequisites: 120 and 336. f,w.

333—Research in Advertising (3). Introduction to techniques, practice of advertising research. Emphasis on understanding research techniques and use of research results. Consumer analysis, attitude measurement, print and broadcast copy testing, evaluation of externally supplied research. f,w,s.

334—International Advertising (3). Background for planning and executing advertising campaigns in foreign markets and relating them to economic, cultural and political environments. Prerequisites: 120 and 336. w.

335—Impact of Advertising on American Culture (3). Philosophical, political, social roots of advertising. Readings in advertising history and literature. Study of such topical issues as materialism, sexism, racism, stereotyping, etc. Prerequisites: 120 and 336. f,w.

336—The Graphics of Journalism (3). Introduction to the graphic arts and their use in the design and production of the visual mass media. From paper making and typography to computer graphics and desktop publishing. Prerequisite: junior standing. f,s.

337—Advertising Design (3). An advanced course in advertising graphics, layout and production. Emphasizes visual problem solving. The course is designed for student who are seeking a career in advertising art direction. Final portfolio presentation. Prerequisite: advertising core courses. f,w.

338—Business and Economics Reporting (3). (same as Finance 338). Advanced reporting course concentrating on writing and reporting about business and the economy. Emphasis on sources, records, documents and writing techniques. Prerequisites: 306 and instructor's consent. w.

339—Advertising Law and Ethics (3). Social impact of advertising in modern America and laws, regulations and codes of conduct which guide the profession. Prerequisite: 120 and 336, and 321.

340—Fundamentals of Photojournalism (3). A rigorous, skills course for advanced students preparing for a career in photojournalism consisting of weekly exercises in black and white and color photographic story telling and lectures that explore the philosophical, historical and ethical roots of the profession. Prerequisite: junior standing.

341—Advanced Techniques in Photojournalism (3). Advanced techniques and problem solving in photojournalism. Stresses lighting techniques—available, studio, electronic flash and color correction of color film. Strobed documentary, protraiture, fashion, food, architecture, sports. Prerequisite: 140. f,w.

342—Staff Photojournalism (3). A laboratory course exploring the photojournalist's role in the news gathering process. As staffers for the Missourian, students cover news, sports, features, food assignments and originate single pictures and stories. Prerequisite: 341. f,w.

343—Electronic Photojournalism (3). Digital photography as a medium, including legal, ethical, editing and professional aspects. Prerequisite: 140 and consent of instructor. f,w.

344—The Picture Story and Photographic Essay (3). Production of photo stories/essays for newspapers, magazines and slide tape presentations. Research, photography, design and layout. Final portfolio will show journalistic strength and versatility in black and white, and color. Prerequisite: 342. f,w.

345—General Semantics in Journalism (3). The everyday usefulness of the methods of science as applied to language and the practice of Journalism. The course deals with the general effect of language habits on journalists and their readers/listeners.

346—History of Photojournalism (3). Examination of the aesthetic and technological development of photography from its invention in 1839 to the present. Primary emphasis on the evolution and impact of the picture press and the documentary tradition in America, although international developments are studied as well. Discussion focuses on the social and political ramifications of photography's use in the news media.

347—Visual Communications (3). How to communicate through pictures. Topics: visual perception, vocabulary, the role of words, picture editing, design and layout, engravers and printers, taste and judgment, camera mechanics. For journalism students who are not photographers. w.

350A—The Creative Process (1). Give students the understanding of and appreciation for the creative process. Teach students techniques for enhancing their own creativity. Encourage students to take intellectual risks, make their own personal explorations and creative journey, and celebrate creativity in others. Prerequisite: junior standing.

350B—Media and Art Criticism: The Role of the Critic (1). Give students the understanding of and appreciation for the creative process. Teach students the applied techniques of criticism: art, film and media. Prerequisite: junior standing. f,w.

350C—Writing Long-Form Stories (1). Give students the understanding of and appreciation for the creative process. Teach students the applied techniques and structure of long-form writing such as documentaries, short stories, screenplays, and novels. Prerequisite: junior standing. f,w.

350D—Media Management and Leadership Theory (1). Dramatic changes in technology and in the media's role in converging technologies requires new management and leadership techniques and paradigms based on new management theories. Students will write case studies examining these changes and applying these new theories. Prerequisite: junior standing. f,w.

350E—Managing and Leading People (1). Dramatic changes in technology and in the media's role in covering technologies requires new management and leadership techniques and paradigms based on new management theories. Students will write case studies examining these changes and applying these new theories. Prerequisite: junior standing. f,w.

350F—Media Strategy (1). Dramatic changes in technology and in the media's role in converging technologies requires new management and leadership techniques and paradigms based on new management theories. Students will write case studies examining these changes and applying these new theories. Prerequisite: junior standing. f,w.

350G—New Media Basics (1). Students will learn how to use the Internet to communicate with others, find human and electronic sources for stories and publish on the World Wide Web. Prerequisite: junior standing. f,w.

351—Broadcast News I (3). Beginning reporting and news writing for radio, television and their on-line services. Introduction to use of audio and video recorders and editing systems in production of news stories. Consideration of ethical isuses, economic factors, relationships with news sources and gender and ethnic diversity in the newsroom and in news stories. Prerequisite: 105. f,w,s.

352—Broadcast News II (3). Introduction to general assignment reporting skills for the newsroom environment. Instruction in time management, writing, storytelling, and performance. Team skills and ethnic diversity in the newsroom are discussed. Students begin work for broadcast newsrooms. Prerequisite: 351. f,w,s.

353—Broadcast News III (3). Intermediate reporting and news writing skills for radio and television. Advanced techniques in the use of video and sound in production of news stories. Prerequisite: 352. f,w,s.

354—News Producing (3). Instruction in techniques of television newscast preparation. Emphasis on role of the television news producer. Prerequisite: 353. f,w,s,ss.

355—Advanced Broadcast Reporting (3). In-depth reporting and editing for radio or television; advanced production techniques; emphasis on writing, interviewing, effective use of audio or videotape at KOMU-TV or KBIA. Prerequisites: 353. f,w,s.

356—Advanced Internet Applications for Radio/TV News (3). Integration of advanced Internet research and publishing skills with production and management of the KOMU-TV/KBIA Radio world wide web news service. Prerequisite: 352. f,w,s.

358—Advanced News Communication (1). This course will examine and practice the components of effective interviewing and on-set and live reporting for television news. Students will anchor KOMU-TV's morning newscasts. Prerequisite: 352. f,w,.

359—Seminar in Radio-TV News (3). Seminar in network and local news process, in coverage of major issues and social problems, in relationships of radio-TV news and government institutions. Not for students who have taken 470. Prerequisite: instructor's consent.

360—Intermediate Writing (3). In-depth research and writing techniques. Students produce articles for the Missourian and school-produced magazines or other publications. Prerequisites: 306 or equivalent and instructor's consent. f,w.

361—Advanced Writing (3). For those who wish to emphasize writing as a career. In addition to writing assignments, students discuss writings of well-known magazine and book authors. Prerequisites: 306, 360 and instructor's consent. w.

362—Magazine Design (3). Introduction to typography of magazines from manuscript markup through layout to page proof. Extensions and limitations of typography are considered in light of current practice and economic possibilities. f,w,s.

363—Magazine Editing (3). Review of grammar, punctuation, style rules: measuring articles copy fitting: writing captions, titles; editing, proofreading, condensing, rewriting magazine articles. Prerequisites: 110, 306. f,w,s.

364—Corporate Communication (3). The role public relations plays in business communications. Press relations, news releases, employee publications and internal communications, shareholder relations, financial public relations, public affairs and corporate social responsibility. Prerequisites: 120 and 336. f,w.

365—Magazine Staff (3). A laboratory course exploring the role of editorial staff in the magazine editing process. As staff for school-produced magazines, students plan, edit, write display type, proofread and coordinate with writers, photographers and designers. Prerequisites: 360, 363 and instructor's consent.

366—Advanced Magazine Design (3). Continuation of 362. Class critiques of spreads, sequences, and magazines are implemented by students who make typographic speci-

fications and lay out individual spreads, and complete magazines for actual printed production. f,w,s.

367—American Magazine History (2). Review of American magazines with the major emphasis on contemporary publications. Project papers present analysis of today's magazines. w.

368—Magazine Publishing (3). The audience, economics, job opportunities and content of the American magazine. Deals with general audience and specialized magazines, business and institutional magazines, news magazines, etc. Case histories of individual magazines, guest lecturers from various fields. w.

369—New Media (3). Examination of the emerging forms of information delivery by computer and related convergence of print and broadcast media. Students gain practical experience in the production of an electronic information delivery product. Prerequisites: 104 or 105, and junior standing. f,w.

370—International Issues Reporting (3). An advanced professional seminar on how to recognize, report and write about the domestic influence of international political, economic and cultural problems and trends. Prerequisites: J306 or J349. Letter grading only.

371—International News Media System (3). A comparative survey of current news media systems and how they affect the international flow of information. Newspapers, news agencies, broadcasting and satellite networks of the world are analyzed. Prerequisite: junior standing. Letter grading only. f.

372—International Journalism (3). An examination of the gathering, editing and dissemination of international news. The impact of social, economic, cultural and political structures on news media performance is evaluated. Prerequisites: junior standing. Letter grading only. w.

373—The Community Newspaper (3). The role of the newspaper in the community. Handling of news categories especially applicable to smaller newspaper. Field trips giving students experience in publishing newspapers in the state. Prerequisites: 104 or 105. w.

374—The Suburban Press (2). Examines the operation, management, and news practices of America's suburban press. Emphasizes unique qualities, problems and advantages of suburban newspapers and the communities and governments they serve. Prerequisites: 104 or 105.

375—Newspaper Management (2). Organization, accounting methods, personnel, rate structures, equipment, production, laws and regulations of concern to newspaper management. Prerequisites: 120 or 320.

377—Newspaper Graphics Desk Management (3). Survey of management of photographic journalism, art illustration and design in newspapers; includes work on graphics desk of Columbia Missourian. Prerequisites: 341 or 336 or 363 and instructor's consent.

381—Creativity and Innovation in Journalism (3). To provide students an appreciation of creative process, to teach students methods to enhance creativity, to provide historical and philosophical background for creative process. w.

385—Careers Seminar (1). Course helps students develop skills for appropriate professional careers, examine media leadership issues, write research paper. w.

386—Economics and Finance of the Media (3). Analysis of the economic and financial environment of mass media. Examine mass media as they are financed and as they are affected by advertisers, competition, financial markets, etc. w

387—Journalism as Communication (2). (same as Journalism 487). Journalism from a scientific standpoint. Introduction to scientific method, philosophy of science, with applications to the study of journalism and communication. Basis of quantitative research and theorizing about journalism and communication. f,w,s.

389—Media Management and Leadership (3). Dramatic changes in technology and the media's role in converging technologies requires new management and leadership techniques and paradiams. Students will write case examining these changes. Prerequisites: instructor's consent.

390—Journalism and Democracy (3). This course seeks to cultivate critical-thinking skills by helping students synthesize and apply knowledge gained from a journalism education to the evaluation of news media performance in a democratic society. Prerequisite: 306 and 250 and second-semester senior standing. Undergraduates only.

392—Intersession Colloquium (1). Lecture portion of any course the student plans to take later during an intercession, with the exception of courses 112, 323, 400, 490 and 499. Prerequisite: Dean's consent. f,w,s.

395—Area Seminar (3). Special lectures, readings, discussions relating to the urban journalism, state government reporting or local public affairs reporting programs. f,w,s.

400—Problems (1-4). Individual work on chosen and specified problems not associated with thesis or project. Topic must be arranged with supervising teacher prior to registration. f,w,s,ss.

401—Mass Media Seminar (3). Concepts, functions and major problems of print and electronic media in the United States. Two hours lecture and one hour of discussion lab each week. f,w.

402—Philosophy of Journalism (2). Seminar deals with wide assortment of philosophical questions in Journalism, but concentrates on epistemology, political press theory and ethics. Such questions as "objectivity" in journalism, press responsibility, professionalism. f.

404—History of Mass Media (3). American mass media from colonial days to present in the context of social, economic and political change. History research. Graduate students only. f,w.

406—Seminar in Communications Law (2). Discusses contemporary issues in press-bar relationships. Discussions led by law students and journalism graduate students, with occasional guests from each area. Prerequisites: 304 or instructor's consent. f,w.

407—Information Theory (3). Concepts and functions; information storage, retrieval, indexing via electronic computer. w.

408—Research Methods in Journalism (3). Research methods of utility in journalism and philosophy of science. Emphasis on understanding common qualitative and quantitative methods and tools. Prerequisite: six hours of journalism or instructor's consent. f,w,s.

412—Photography in Society (3). Social and political dimensions of still photography with emphasis on critical thinking and analysis in visual communication. f,w.

421—Doctoral Seminar (3). This course is designed to meet the University requirement for a first-year qualifying examination process for doctoral students, involve students in research early in their programs and encourage students to recruit members of their doctoral committees.

422—Seminar in History and Principles of Journalism (3). Discussion of journalism history, historical resources and methods, and journalism historians' work. Research projects and papers. f.

424—Theory of Mass Communication (3). Major communication theories and theorists. Interpersonal theories are included as they relate to mass communication. f,w.

425—Environmental Research for Journalists (3). This class is an introduction for journalists to understand quantitative research about the environment. Applications of advanced parametric and non-parametric statistical methods in environmental research are stressed. Students evaluate diverse environmental research.

426—Covering the Legal System (3). (same as Law 395). Law students and journalism students work in teams to report and write case studies accompanied by biographical profiles. The course is taught jointly by a law professor and journalism professor. w.

428—The Literature of Journalism (2). Reading of ten basic books about journalism. Several books are assigned to everyone; several are assigned on an individual basis, and several are electives. Oral reports, short papers, and class discussion. f,w.

430—Seminar on Topics in Journalism (3). Problems, issues and approaches to research in selected topic areas. Specific content varies by needs of faculty and students and will be announced in advance. Prerequisites: Instructor's consent.

431—Proseminar: Science, Society and the News Media (3). Seminar explores the complex interactions among science, biomedicine, the news media and the public. Seminar is more about media sociology than the sociology of science. w.

432—The Mass Media and the Presidency (3). This seminar examines that historical triad of the free expression clauses of the First Amendment, the presidency and the American mass media through readings, class assignments and a project. w.

433—Proseminar in Communications (2). Seminar on professional and academic issues in journalism and communication. Specific discussion topics selected by faculty and students on a per class basis. f,w.

435—Impact of Advertising on American Culture (3). Philosophical, political, social roots of advertising. Readings in advertising history and literature. Study of such topical issues as materialism, sexism, racism, stereotyping, etc. Prerequisites: 120 and 336. f,w.

436—Issues and Theories in International Communication (3). This course examines current issues in international communication, including a comparative study of the mass media systems of nations with different cultural, political, social and economic structures. Prerequisite: graduate standing. Letter grading only. w.

438—Controls of Information (3). A detail of actions by society and by the communications media calculated to limit or alter the content of information in the United States. f.

439—Advertising Law and Ethics (3). Social impact of advertising in modern American and laws, regulations and codes of conduct which guide the profession. Prerequisite: 120 and 336.

440—Controls of Information (3). A detail of actions by government, largely the federal government, calculated to limit or alter the content of information in the United States. w,s.

442—Information Theory (3). Concepts and functions: information storage, retrieval, indexing via electronic computer. w.

445—General Semantics in Journalism (3). The everyday usefulness of the methods of science as applied to language and the practice of journalism. The course deals with the general effect of language habits on journalists and their readers/listeners.

446—Media Ethics (3). An introduction to and application of ethical theory to their contemporary mass media. Prerequisite: Senior standing/ graduate status.

447—Critical Analysis of the Mass Media (3). An overview of both the content and method of contemporary media criticism. Graduate Standing.

448—Readings in Journalism (1-5). Directed readings for doctoral candidates. Designed to supplement work in other courses, and to broaden student's knowledge of trends, interpretations, and developments in the media. f,w,s.

452—Advanced Seminar, Theory of Communication (2). In-depth investigation of communication theory, with emphasis on problems of theory building in communication. Prerequisites: 424 or 436 or instructor's consent. f,w.

458—Advanced Research Methods (3). Experimental design, factor analysis, semantic differential and Q methodology as tools for the researcher in journalism, communication.

f,w.

470—Seminar in Radio/TV News (3). Seminar in network and local news process, in coverage of major issues and social problems, in relationships of radio-TV news and government institutions. Prerequisite: instructor's consent.

472—MA Project Seminar (1). Choosing and designing an appropriate profession project; preparation to carry out work successfully; discussion of trends and future directions in various areas of journalism. Must be completed before starting the professional project.

474—MA Thesis Seminar (1). Choosing and developing an appropriate research topic for a thesis; designing a research strategy and learning appropriate investigative techniques. Must be completed before starting thesis. f,w

476—Area Seminar (3). Seminar designed to accompany 499, Area Problem. Through readings and discussions the Plan B student examines the special area related to the project. f,w,s.

478—Area Problem (4-9). Work project enabling Plan B student to demonstrate professional competence; may be one offered in a graduate reporting program or a creative project designed to meet a particular interest of student. Offered on S/U basis only. f,w,s,ss.

485—Careers Seminar (1). Course helps students develop skills for appropriate professional careers examine media leadership issues, write research paper. w.

486—Economics and Finance of the Media (3). Analysis of the economic and financial environment of mass media. Examine mass media as they are financed and as they are affected by advertisers, competition, financial markets, etc. w.

487—Journalism as Communication (2). (same as Journalism 387). Journalism from a scientific standpoint. Introduces scientific method, philosophy of science, with applications to the study of journalism and communication. Basics of quantitative research and theorizing about journalism and communication. f,w,s.

489—Media Management and Leadership (3). Dramatic changes in technology and the media's role in converging technologies requires new management and leadership techniques and paradisms. Students will write case examining these changes. Prerequisites: instructor's consent.

490—Research (1-9). Guidance for graduate students engaged in plan A for the M.A. degree and for all doctoral candidates engaged in investigations looking toward production of thesis. f,w,s,ss. Graded on a S/U basis only.

491—Graduate Assembly (0). Required of all graduate students in their first semester in the journalism graduate program. S/U graded only. f,w.

Laboratory Animal Medicine Area Program

The Laboratory Animal Medicine Program is administered within the College of Veterinary Medicine. The requirements for this degree program are described under the **Laboratory Animal** specialization area section of the **Master of Biomedical Sciences** degree offered through the **College of Veterinary Medicine**.

Law

School of Law
Center for the Study of Dispute Resolution
206 Hulston Hall (573) 882-2020
e-mail: umclawcdr@missouri.edu
http://www.law.missouri.edu/csdr/

Students interested in the juris doctor (JD) program should write or call the admissions adviser, Admissions Office, 103 Hulston Hall, Columbia, Mo. 65211, (573) 882-6042, 1-888-MULAW4U (685-2948), or send e-mail to gregorysl@missouri.edu. The web site is http://www.law.missouri.edu.

FACULTY

Barbara "Bobbi" McAdoo, director of advanced studies in the Center for the Study of Dispute Resolution, professor, JD, George Washington University.

Leonard Riskin, director of the Center for the Study of Dispute Resolution, C.A. Leedy Professor, JD, New York University, LL.M., Yale University.

Timothy Heinsz, dean, Earl F. Nelson Professor, JD, St. Louis University.

Robert G. Bailey, assistant dean, JD, University of Missouri-Columbia.

Jean Sternlight, professor, senior fellow at the Center for the Study of Dispute Resolution, JD, Harvard University.

James Westbrook, professor emeritus, JD, Duke University, LL.M., Georgetown University.

Chris Guthrie, associate professor, senior fellow at the Center for the Study of Dispute Resolution, JD, Stanford University.

Ilhyung Lee, associate professor, JD, Boston College.

James Levin, associate director of the Center for the Study of Dispute Resolution, adjunct clinical professor, JD, Northeastern University.

DEGREE: Master of Laws in Dispute Resolution

Students in the Master of Laws (LL.M.) in dispute resolution program have a unique and challenging opportunity to gain a comprehensive understanding of theoretical, policy, design and ethical issues in alternative dispute resolution. Designed for practitioners and scholars with an interest in serious study and practice beyond the juris doctor degree, the program includes:

- A blend of theoretical analysis, practitioner skills and systems design work
- Integration of dispute resolution processes into substantive law contexts
- Promotion of multidisciplinary analysis and dialogue
- Nationwide externship placements
- Participation in the delivery of the JD curriculum
- Study and dialogue with faculty who are leaders in the alternative dispute resolution field

The LL.M. program may be tailored individually to meet the needs of students with backgrounds as advocates, neutrals, law-trained court administrators and government agency personnel.

DEGREE REQUIREMENTS: The LL.M. program requires 24 credit hours of study. 11 credits are required courses in the law school and 13 credits are electives. Six of the elective credits can be taken at other MU departments. To graduate, a student must have completed all graduate work attempted at MU with a grade point average of 3.0 (A=4.0) or better.

With full-time study, students should complete degree requirements within one academic year of matriculation. Though admitted on a limited basis, part-time students in a continuous course of study could probably complete the program within two academic years.

Following are the required core courses together with some "highly recommended" electives that have obvious relevance to the dispute resolution field. Students choose electives from the law school and other MU departments according to their interests and statement of purpose for enrolling in the program.

August Special Session:
Negotiation and Mediation Perspectives and Skills
(Required only for students without a mediation background, an intensive course in negotiation and mediation skills will be delivered in August before regularly scheduled courses begin.)

Fall Semester:
Required Core Courses
Dispute Resolution Processes I
Understanding Conflict
Highly Recommended Electives
Mediation
Negotiation
Organizational Dynamics
Organizational Analysis and Change
Practicum on Dispute Resolution Training and Education
Research Project

Winter Semester:
Required Core Courses
Dispute Resolution Processes II
LL.M. Dispute Resolution Seminar
Highly Recommended Electives
Arbitration
Dispute Resolution Case Studies and Biographical Profiles
International Dispute Resolution

May and June Session:
LL.M. Externship (recommended)

ADMISSION REQUIREMENTS: To be considered for admission to the LL.M. program in dispute resolution, a student must have a juris doctor degree from an American Bar Association-accredited law school. International applicants are required to hold or expect to receive a degree from a law faculty outside the United States before the start of the LL.M. program. Applicants must possess a minimum 2.5 (A=4.0) grade point average in their JD program, a 3.0 GPA for work completed in any additional graduate or advanced degree programs, or relevant employment experience. International applicants also must have a TOEFL score of 600 or better. ***Application materials and additional information about the program are available by writing or calling the Director of Advanced Studies, Center for the Study of Dispute Resolution, 206 Hulston Hall, Columbia, MO 65211, (573) 882-2020, e-mail: umclawcdr@missouri.edu. Or visit the web site at http://www.law.missouri.edu/csdr/***

COURSES

566L—Dispute Resolution (2-3). Study of various dispute resolution processes including interviewing and counseling, negotiation, mediation, arbitration, and "mixed processes" such as the mini-trial. Consideration of issues involved in creating dispute resolution systems and choosing among available processes.

596L—International Business Transactions (2-3). A survey of legal problems and institutional arrangements involved in international trade and investment; private law of international trade, governmental regulation of international trade and investment, international regulation of international trade and investment.

681—Dispute Resolution Process I (3). Study of dispute resolution processes to understand the theoretical and practical underpinnings of adjudicative (e.g., litigation and arbitration), evaluative (e.g., neutral evaluation and summary jury trials) and facilitative (e.g., negotiation and mediation) process. Emphasis on assistance to clients in choice of appropriate methods for preventing or resolving disputes and on ethical and professional responsibilities of advocates and neurtrals in various processes. Prerequisite: instructor's consent.

682—Dispute Resolution Processes II (3). Analysis of system design principles and the management of multi-party complex disputes. Course will include overview of statutes, regulations, court rules and general policy considerations for the development of systematic approaches to the resolution of disputes as well as the consultation process inherent in system design work. An underlying theme for this course will be issues of program quality. Students will review scholarly work evaluating the ADR field and study basic research/evaluation methodologies. Prerequisite: instructor's consent.

685—LL.M. Dispute Resolution Seminar (2-3). Development and presentation of substantial research paper on current topic in dispute resolution. Supervision of this work by appropriate faculty will be determined according to the topic selected. Prerequisite: LL.M. students only.

686—LL.M. Externship (1-99). Student will be placed (or secure placement) with attorney, professional mediator or arbitrator, or dispute resolution agency (government-based or private) for an externship ranging three to nine weeks. Students will observe and, to the extent possible, participate in dispute resolution activities of mentor. Journal entries form basis for credit. Externship placements will be local, national or internation. Prerequisite: LL.M. students only. Graded on a S/U basis only.

687—LL.M. Research Project (1-3). Substantial research project on selected topic of choice. Prerequisite: LL.M. students only.

690—Negotiation and Mediation Perspectives and Skills (2). Interactive training program that focuses on the role of the mediator in facilitating settlement. Topics include: theories of competitive and problem solving orientations to negotiation; strengths/weaknesses of mediation as a dispute resolution process; and overview of mediator tasks and responsibilities, such as framing issues, understanding party interest, generating options, and reaching agreement. This course is required for LL.M. students without mediation background and will be delivered in an intensive format during August before regularly scheduled courses begin. Prerequisite: instructor's consent. Graded on S/U basis only.

692—Practicum on Dispute Resolution Training and Education (1). Structured training experience through participation in the first-year curriculum project; service as judges in J.D. student competitions, such as negotiation and client counseling; and assignments to appropriate upper division courses to assist with development of dispute resolution modules. Credit is earned for work over the entire academic year. Prerequisite: LL.M. students only. Graded on a S/U basis only.

697—Understanding Conflict (3). Study of the origins, nature, and functions of conflict, using perspectives from a variety of disciplines and from literature and religion. The course will include special attention to the idea of conflict as opportunity and will draw on contemplative practices, of the kind that have been developed in many religious traditions, to aid in understanding the relationship between inner and outer conflict. It will focus persistently on the connections between one's assumptions about conflict and one's attitudes and practices about dispute resolution and lawyering. Prerequisite: instructor's consent.

699—Topics (1-99). Special and emerging topics in dispute resolution. Subject, content and credit varies, depending on available faculty and student interest. Prerequisite: instructor's consent.

Linguistics (Minor)

College of Arts and Science
107 Swallow Hall (573) 882-4731

FACULTY

Louanna Furbee, chair, professor of anthropology, PhD, University of Chicago.
James D. Amerman, professor of communication science and disorders, PhD, University of Illinois.
Martin J. Camargo, professor of English, PhD, University of Illinois at Urbana-Champaign.
Nelson Cowan, professor of psychology, PhD, University of Wisconsin-Madison.
Daniel E. Gulstad, professor emeritus of Spanish, PhD, University of Illinois.
Donald M. Lance, professor emeritus of English, PhD, University of Texas-Austin.
Eugene N. Lane, professor of classical studies, PhD, Yale University.
Dorothy Watson, professor of curriculum and instruction, PhD, Wayne State University.
Paul Weirich, professor of philosophy, PhD, University of California-Los Angeles.
C. Gilbert Youmans, professor of English, PhD, University of Wisconsin-Madison.
Pamela J. Benoit, associate professor of communication, PhD, Wayne State University.
Magdalena García-Pinto, associate professor of Spanish and director of women studies, PhD, University of Texas-Austin.
Benjamin L. Honeycutt, associate professor of French, PhD, The Ohio State University.
Linnea D. Lilja, associate professor of curriculum and instruction, PhD, University of Minnesota.
Flore Zéphir, associate professor of French, PhD, Indiana University-Bloomington.
Luis Lopéz, assistant professor of Spanish, PhD, Cornell University.
John Zemke, assistant professor of Spanish, PhD, University of California-Davis.
Evan Smith, University and non-credit curriculum specialist, PhD, Indiana University-Bloomington.

Graduate degrees in linguistics are not offered. MA and PhD degree programs with emphasis in linguistics and language are available in some cooperating departments (anthropology, communication, English, romance languages, philosophy).

The linguistics area program is staffed by faculty from various departments. Supporting course work may include foreign language, literature, psychology, philosophy, English, education, speech, anthropology or South Asian studies.

Financial aid, when available, is arranged through the participating departments.

For further information, write the Chair of Linguistics, 107 Swallow Hall, Columbia, MO 65211, or the relevant department.

COURSES

202—American Phonetics (3). (same as Communicative Science and Disorders 201). Analysis of Sounds of Midwestern American dialect. Standards of pronunciation, feature analysis, transcription, articulation mechancis, coarticulation.

212—Anatomy and Physiology Speech Mechanism (3). (same as Communication Science and Disorders 210). Introduction to anatomical and functional aspects of the speech mechanism.

235—Philosophy and Language (3). (same as Philosophy 235)

252—Survey of Minority & Creole Languages of the U.S. & the Caribbean (3). (same as Spanish 252 and French 252). Analysis of the state of the minority languages of the U.S. and the Creole languages of the Caribbean with particular attention to the social status of these languages and speakers' attitudes toward them in context of ethnic, cultural, and national identity (taught in English). Prerequisite: sophomore standing.

260—Phonetics (3). (same as Spanish 260). (Spanish Language).

270—Culture as Communication (3). (same as Anthropology 270, and Communication 270.)

290—Honors Thesis (3). Based on an original research project in theoretical or applied linguistics. Topic, director, and second reader approved by Linguistics Committee, College of Arts & Science. Prerequisite: qualification for Honors degree.

308—Historical Linguistics (3). (same as Anthropology 308).

311—History of the French Language (3). (same as French 311).

312—Gender, Language and Communication (3). (same as Communications and Anthropology 312). Relationships among gender, language, nonverbal communication, and culture. Prerequisite: junior standing or departmental consent.

313—History of the Greek and Latin Languages (3). (same as Classical Studies 311).

314—Formal Logic (3). (same as Philosophy 314). Presents the method of truth trees for sentence and predicate logic. Examines proofs concerning the decidability, soundness, and completeness of formal systems. Emphasizes the theory of formal systems. Prerequisite: 153 or graduate status.

315—Language and Discourse (3). (same as Communication 315)

316—Introduction to Old English (3). (same as English 315).

321—Renaissance and 17th-Century English Literature (3). Topics (e.g., The Metaphysical Poets, Themes in Shakespeare) announced at time of registration. May repeat to six hours with department's consent. Prerequisite: junior standing.

340—Structure of American English (3). (same as English 340).

341—History of the English Language (3). (same as English 341).

342—Regional and Social Dialects of American English (3). (same as English 342).

343—Principles of Teaching English as a Second Language (3). (same as English 343).

344—Topics in Linguistics (3-6). (same as English 344).

346—Language and Culture (3). (same as Anthropology 346).

350—Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisites: one Linguistics course & instructor's consent.

361—History of the Spanish Language (3). (same as Spanish 361).

370—Practical Phonetics for Fieldwork (3). (same as Anthropology 370). Self-paced course using computer and

tape recorded lessons from world's languages. Teaches practical articulatory and trancription phonetics. Weekly meeting with instructor to monitor progress, resolve questions. Prerequisites: junior standing or instructor's consent. f,w.

372—Techniques in Linguistic Analysis (3). (same as Anthropology 372, Romance Languages 372).

373—Linguistic Phonetics (3). (same as Anthropology 373, Romance Languages 373).

374—Issues in Linguistic Analysis (3). (same as Anthropology 374 & Linguistics 374). Key issues in analysis of languages such as accounting for variation, nature and abstractness of underlying representations, and typological characteristics treated comparatively. Prerequisite: 372. w.

378—Structure of Modern French (3). (same as French 378).

379—Structure of Modern Spanish (3). (same as Spanish 379).

380—Linguistic Theory and Language Acquistion (3). (same as Spanish 380). The goal of this class is to study the implications of current linguistic theory for contemporary research on second language acquisition. In particular, the hypothesis that second language acquisition follows some of the same principles as first language acquisition is explored. Course is taught in English. Prerequisites: Spanish 379, French 378, English 340 or Linguistics 372

381—Psycholinguistics (3). (same and Communicative Science and Disorders 381). Examines the knowledge and processes that underlie the human ability to produce and understand language. Prerequisite: senior or graduate standing.

382—Speech Perception (3). (same as Communicative Science and Disorders 382). Selected topics in the perceptual processing of spoken language. Prerequisite: senior or graduate standing.

383—Studies in Linguistics (3). Topic varies according to instructor. Prerequisite: instructor's consent, instructor's consent for repetition.

393—Field Methods in Linguistics (4). (same as Anthropology 393).

400—Problems (1-99.9). Independent study through readings, analysis of special linguistic problems, reports. Prerequisites: one Advanced Linguistics course & instructor's consent.

411—Speech Physiology (3). (same as Communication Science and Disorders Program 411)

428—Studies in Psycholinguistics (3). (same as Psychology 428).

440—Studies in the English Language (3). (same as English 440).

460—History of the German Language (3). (same as German 460).

461—Middle High German (3). (same as German 461).

483—Seminar (3). Topic varies according to instructor. Prerequisites: instructor's consent, instructor's consent for repetition.

490—Research in Linguistics (1-99). Graded on a S/U basis only.

494—Syntax (3). (same as Anthropology 494).

Management

College of Business and Public Administration
215 Middlebush Hall (573) 882-7374

The departments of management, finance and marketing in the School of Business jointly offer the master of business administration and the doctor of philosophy in business administration interdisciplinary degrees. PhD students may pursue a concentration in management. Program information and requirements are given under **Business Administration**.

COURSES

202—Fundamentals of Management (3). Introduction to the basic concepts of management and organization; their application to operations and personnel management. Prerequisite: Completion of 45 semester hours. f, w, cor.

254—Introduction to Business Law (3). The legal aspects of business related to society—introduction to the legal system; constitutional, criminal, tort law; contracts and sales law cases and problems; administrative regulation of business and consumer issues. Prerequisite: completed 30 hours. f,w. cor.

255—Legal Aspects of Business Organization and Operation (3). Includes agency and employment relationships, sole proprietorships, partnerships, and corporations, also operational aspects of business associations such as administrative regulation, taxation, bankruptcy, and trade regulation. Prerequisite: 254. Restricted to B&PA students. f,w.

300—Problems (1-99).

305—Elements of the Law of Business (3). Role of law in societies; body of law applicable to commerce and industry. Open only to graduate students. No credit given to those having prior courses in business law.

308—Operations Management (3). Managerial analysis of operating problems, with emphasis on planning and control systems. Prerequisites: 202. f,w.

310—Human Resource Management (3). Manpower policies, procedures of business enterprise. Prerequisites: 202. f,w. cor.

311—Collective Bargaining (3). Content, negotiation, administration of collective labor agreements and settlement of disputes. Prerequisites: 202 and junior standing.

312—Total Quality Management (3). Introductory, comprehensive approach to quality planning, analysis, and control. Applications orientation. Integrates customer needs, product and service design and delivery, and continuous improvement into all organizational activities. Examines full range of behavioral, technical, and organizational aspects relating to quality. Prerequisite: Management 202.

318—Management Science (3). Further development of models and quantitative analysis as applied to production management problems. Management research design and experimentation; computer applications; quantitative case analyses; individual industrial field studies. Corequisite: Statistics 250 and Accounting 258 or Computer Science 103, junior standing.

319—Production Systems Analysis (3). Constructive and quantitative analysis of models of inventory and production systems; uncertainty, risk, and policy considerations; systems design/simulation; analysis of networks; management problems in application. Prerequisite: 308.

320—Human Resource Management Administration Law (3). Analysis and evaluation of legal and administrative regulations of terms of employment; Fair Labor Standards, discriminatory practices, safety and health regulations, other regulations. Prerequisites: 310 and senior standing. w.

329—Organizational Behavior (3). Examines theoretical constructs and research findings on human behavior in work organizations such as businesses, especially individual differences, dyadic relations and small group behavior. Prerequisites: 202. f,w.

330—Organizational Theory (3). Elements of the managerial process; emphasis on theory of organization structure and design and the impact of technology and culture on organization systems. Prerequisite: 202. f,w. cor.

335—Topics in Management (3). Selected current topics in management. Offered on an experimental, one-semester basis only. Prerequisite: to be determined each time course is offered.

345—Management of Service Operations (3). Managing services, especially the operation's activity in service firms. Includes determining the service package, forecasting service demand, managing demand, capacity analysis and management, scheduling, cost control, service quality, and human resource management. Standardization, franchising, and service automation addressed. Prerequisite: 202.

347—Compensation Theory and Practice (3). Examines the empirical research and theory relating to the effect of compensation administration systems upon employee satisfaction and performance. Analysis of financial compensation systems and benefit programs in use in modern organizations. Prerequisite: 310.

353—Selected Problems in Human Resource Management (3). Advanced studies in selected administrative and technical policies, practices in employee relations, with individual and group project work, research. Focuses on policy issues, research findings, advanced techniques. Prerequisites: 310.

356—The Law of Commercial Credit Transactions (3). Purchase and sale of goods, services and real property—discussion includes drafts, notes, security agreements under the Uniform Commercial Code, and credit financing of real Prerequisite: 254. f.

375—Management Policies and Problems (3). Enterprise-level case studies, simulations, similar exercises to integrate business functional decisions; assessment of environmental influences on business. Development, implementation of company strategies. Prerequisites: 202, Marketing 204, Finance 203 and senior standing in B&PA. f,w.

383—Advanced Organizational Behavior (3). Based upon behavioral science concepts and research findings directed toward understanding and explaining human behavior within organizations. Case studies, individual or team projects. Prerequisites: 329. f,w.

390—Professional Management Internship (3). Provides experience with management activities in business organizations (or, occasionally, in a govenmental or not-for- profit setting). Students are required to prepare and execute a plan of study approved by the instructor and to complete written assignments detailed in the plan. Course only satisfies a professional elective requirement of the program. Prerequisite: B&PA student with a management concentration, 202, and Intenship Coordinator's consent. Graded on S/U basis only. s.

400—Problems (1-99). Graduate students may select topics for study and investigation. Graded on a S/U basis only.

405—Seminar in Management (1-99). Intensive studies of current research and issues. Readings, independent investigations, reports. Prerequisites: open to Ph.D. students, or instructor's consent.

418—Business and Economic Research (3). (same as Finance 418.)

435—Topics in Management (3). Selected current topics in management. Prerequisite: graduate standing.

436—Advanced Human Resource Mangagement (3). Analysis of research and practice in planning for attracting, selecting, developing, and disciplining of employees at work. Prerequisites: graduate standing.

437—Management of Labor Relations (3). Managerial approaches to collective bargaining. Negotiation, grievances, agreement administration; emphasis on recent developments. Prerequisite: graduate standing.

438—Organizational Behavior and Management (3). An examiniation of factors influencing behavior in organizations. An analysis of research, theory, and current practices dealing with managing people in work organizations. Prerequisite: graduate standing.

439—Organizational Theory and Design (3). Organizational design; relationships to technical, cultural, and environmental factors; problems of effecting change. Prerequisites: graduate standing. w.

441—Information Requirements Analysis (3). Conceptual tools and techniques for analyzing and designing com-

puter-based systems. Systems development life cycle, feasibility study, defining and analyzing existing system, data flow modeling techniques, logical design of new system, implementation and conversion planning. Prerequisites: graduate standing, Accountancy 258 or equivalent.

442—Decision Support Systems (3). An examination of the role of Decision Support Systems (DSS) in organizations from both a theoretical and applied viewpoint. The components of the database, model base and the user system interface are applied in the context of both the mainframe and microcomputer. Prerequisites: Business Administration 320.

443—Information Systems Implementation (3). Theory and methods to manage information systems development. Management of project phases and activities, behavioral models for system design, and application of organizational behavior and theory concepts. Prerequisites: Accountancy 258 and graduate standing.

444—Entrepreneurial Ventures: Creation & Mngmnt. of High Growth Firms (3). Analysis of management challenges facing entrepreneurial startups and alternative strategic responses to those challenges. Views issues from multiple functional perspectives to design cross-functional solutions to entrepreneurial problems. Prerequisites: graduate standing.

445—Management of Information Resources (3). Corporate level management of information systems technology in organizations. Concepts of information systems planning models, applications portfolio strategies, office information systems and corporate-level MIS effectiveness. Prerequisites: Business Administration 320 and two MIS courses beyond programming.

450—Current Issues in Human Resource Management (3). Exploration of current trends, issues, and controversies involving the managing of human resources in organizations, with an emphasis on how human resources can provide competitive advantage. Considers multiple perspectives, including that of employers, employees, and other stakeholders. Prerequisite: graduate standing.

465—Organizational Analysis and Change in the Public Sector (3). (same as Public Administration 465). Investigates the social and psychological dynamics of organizational diagnosis, feedback and learning, intervention, planned change. Students study organizational life from the viewpoint of experienced organizational analysts and consultants. The predominant theoretical approach offered in this course is clinical and psychodynamic.

471—Seminar in Organizational Behavior (3). Intensive examination of behavioral sciences focusing on individual and small group behavior within the business organization. Selected topics include employee motivation, leadership, decision making, and group dynamics. Prerequisites: Ph.D. standing or instructor's consent.

472—Seminar in Organization Theory (3). Examination of behavioral sciences focusing on structure and processes of business organizations and environments. Selected topics include structure, environmental influences, organization change, conflict resolution, and interorganizational relations. Prerequisite: Ph.D. standing or instructor's consent.

480—Topics Seminar (1-3). Reading and critical evaluation of selected current management literature and research. Prerequisites: Ph.D. students only. May be repeated.

490—Research (1-99). Thesis research for Ph.D. degree. Graded on a S/U basis only.

Marketing

College of Business and Public Administration
214 Middlebush Hall (573) 882-3282

The departments of marketing, finance and management in the School of Business jointly offer the master of business administration and the doctor of philosophy in business administration interdisciplinary degrees. PhD students may pursue a concentration in marketing. Program information and requirements are given under **Business Administration**.

COURSES

204—Principles of Marketing (3). Institutions, processes, problems involved in transferring goods and services from producer to consumers; emphasis on economics, social aspects. Prerequisites: completed 45 semester hours; Economics 4 or 14 or 51.

300—Problems (1-99).

301—Marketing Topics (1-99). The study of selected topics in Marketing. Subjects may vary from semester to semester. Prerequisites: 204 or instructor's consent, departmental consent for repetition.

309—Marketing Management (3). Analysis of the broad range of managerial marketing issues of relevance to modern business firms. Prerequisites: 204 and junior standing.

313—Marketing Research (3). Examines procedures for defining problems; specifying information requirements; collecting, analyzing, interpreting, and presenting data for use in marketing decision making. Utilizes student projects and research-related computer assignments. Prerequisites: 204, junior standing, Accounting 258 and Statistics 250.

314—Consumer Behavior (3). Dimensions of the consumer market and decision-making process of consumers by analyzing economic, psychological and socio-psychological influences on consumer market and buying behavior. Prerequisites: 204 and junior standing.

335—Management of Promotion (3). The promotion function; special problems associated with the sales force from the managerial point of view. Prerequisites: 204 and junior standing.

336—Sales Management (3). Analyzes effective methods and tools employed by salesmen and field sales managers; emphasis on underlying behavioral and quantitative theory. Prerequisites: 204 and junior standing.

337—Retail Marketing (3). The study of the policies, strategies, methods and procedures for marketing in a retail environment. Prerequisite: 204 and junior standing.

347—Channel Management (3). Determination of marketing channels for distribution of consumer and industrial goods. Particular emphasis on elements of the product mix as they relate to channel decisions. Prerequisites: 204 and junior standing.

350—Marketing, Society, and Government (3). Critical examination of relationships and conflicts between marketing, society and government. Emphasis on contemporary issues pertaining to competition, monopoly, regulation by government. Prerequisites: 204 and junior standing.

355—Contemporary Issues in Marketing (3). Intensive study of selected issues in marketing. Prerequisite: 6 hours Marketing.

358—Purchasing (3). Organization and functions of purchasing departments; particular emphasis on industrial purchasing. Prerequisites: Management 202 and 6 hours Marketing.

360—Quantitative Analysis in Marketing (3). Use of quantitative analysis to solve marketing problems. Prerequisites: junior standing and Statistics 250.

371—World Marketing (3). Examination of the rationale of international trade and the operational aspects of international marketing. Prerequisites: 204 and junior standing.

373—Distribution Management (3). Analysis of transportation and logistics policy and administration, emphasizing use of quantitative aids to decision making. Prerequisites: junior standing.

381—Transportation Policy (3). Problems in intra- and inter-modal competition, consolidation and integration, criteria for public investment, subsidy policies, urban transportation, and analysis of national transportation policy. Prerequisites: junior standing.

390—Marketing Practicum (3). Provides students experience in marketing activities within actual business environments. Students are required to prepare a plan of study which will need to be approved and to perform a variety of writing assignments. Prerequisites: B&PA students with a marketing concentration and instructor's consent. Graded on S/U basis only.

400—Problems (1-99). Graduate students may select topics for study and investigation from fields suggested by undergraduate courses listed above.

401—Seminar in Marketing (3). Intensive studies of selected current issues. Readings, independent investigations and reports. May repeat to 12 hours maximum: Prerequisite: BA 346 or equivalent.

413—Advanced Marketing Research (3). Evaluates the contribution of research to marketing management. Special emphasis on the research used in development of new products and new markets. Prerequisite: BA 346 or equivalent.

444—Advanced Consumer Behavior (3). Basic factors influencing consumer decision making. Attention given to psychological, sociological, economic variables motivation, attitude, learning, personality, small group, social class, demographic factors, culture; analyzes their effects on consumer decision-making process. Prerequisite: BA 346 or equivalent.

465—Marketing Strategy (3). Theory of determining marketing strategy by business firms and organizations. Prerequisite: BA 346 or equivalent.

466—Quantitative Methods for Marketing (3). Examines and appraises use of quantitative tools of analysis in solving marketing problems. Prerequisite: BA 346 or equivalent.

468—Distribution Strategy (3). The role of various modes of transportation, traffic management, warehousing and materials handling in the marketing system. Current transportation and traffic problems analyzed. Prerequisite: BA 346 or equivalent.

470—International Marketing (3). Examination of competition and market structure abroad including common market and trade bloc arrangements. Prerequisite: 346 or equivalent.

471—Markets in Transition (3). Analysis of selected industries with emphasis on marketing activities and environments. Particular emphasis given to forecasting major trends or changes anticipated in markets over the next decade. Prerequisite: BA 346 or equivalent.

480—Current Topics Seminar in Marketing (1-3). Reading and critical evaluation of selected current marketing literature and research. Prerequisites: Ph.D. students only. May be repeated. Graded on S/U basis only.

490—Research (1-99). Thesis research for Ph.D. degree. Graded on a S/U basis only.

Materials Science (Minor)

424 Physics Building (573) 882-6086

FACULTY

Jerry L. Atwood, professor of chemistry, PhD, University of Illinois at Urbana-Champaign.

H. R. Chandrasekhar, professor of physics, PhD, Purdue University.

Meera Chandrasekhar, professor of physics, PhD, Brown University.

Aaron D. Krawitz, professor of mechanical and aerospace engineering and senior research scientist at the Research Reactor Center, PhD, Northwestern University.

Jon M. Meese, professor of electrical engineering, PhD, Purdue University.
Patricia L. M. Plummer, professor of physics, PhD, University of Texas.
James J. Rhyne, professor or physics, PhD, University of Texas.
Paul R. Sharp, professor of chemistry, PhD, Massachusetts Institute of Technology.
Haskell Taub, professor of physics, PhD, Cornell University.
Giovanni Vignale, professor of physics, PhD, Northwestern University.
Samuel A. Werner, professor of physics, PhD, University of Michigan.
Henry W. White, professor of physics, PhD, University of California-Riverside.
Hirotsugu K. Yasuda, professor of chemical engineering, PhD, State University of New York.
William B. Yelon, adjunct professor of physics and group leader at the Research Reactor Center, PhD, Carnegie Mellon University.
Ronald R. Berliner, adjunct associate professor of physics and senior research scientist at the Research Reactor Center, PhD, University of Illinois.
Uee W. Cho, associate professor of mechanical and aerospace engineering, PhD, Brown University.
Rainer Glaser, associate professor of chemistry, PhD, University of California-Berkeley.
V.S. Gopalaratnam, associate professor of civil engineering, PhD, Northwestern University.
C. Michael Greenlief, associate professor of chemistry, PhD, University of Texas-Austin.
John F. Kauffman, associate professor of chemistry, PhD, University of Illinois at Urbana-Champaign.
Paul Miceli, associate professor of physics, PhD, University of Illinois.
Steven P. Neal, associate professor of mechanical and aerospace engineering, PhD, Iowa State University.
Frederick K. Ross, adjunct associate professor of chemistry and senior research scientist at the Research Reactor Center, PhD, University of Illinois.
Sashi Satpathy, associate professor of physics, PhD, University of Illinois.
Steven W. Keller, assistant professor of chemistry, PhD, University of California-Berkeley.
R. Andrew Winholtz, assistant professor of mechanical and aerospace engineering and research scientist at the Research Reactor Center, PhD, Northwestern University.

Materials science is an important component of modern science and engineering. It is represented at MU through a diversified, interdisciplinary set of courses, faculty, research programs and facilities rather than a formal department. It also encompasses many neutron scattering activities at the MU Research Reactor, the finest of its kind at a university in the United States. A minor can be obtained at the MS or PhD levels by students interested in the formal pursuit of knowledge in materials science. Reasons for considering such an option include the following: it may provide the essential information for the conduct of thesis research, it may prove to be a valuable credential for employment and it will provide background information increasingly important to the modern scientist and engineer.

The minor is administered by a steering committee in cooperation with individual departments. Transfer students and special circumstances should be addressed through the steering committee chair and the director of graduate studies in the major department. A set of courses from chemical engineering, civil engineering, electrical engineering, geology, mechanical and aerospace engineering and physics comprises the instructional body to the minor.

MASTER'S MINOR: At least four courses are required, all at the 300 or 400 level. At least two of these must be taken outside the major department in which the student is enrolled. Should 200-level courses be necessary or desirable, they must, in general, be taken as extra courses.

DOCTORAL MINOR: A total of six courses (including those for the MS) are required. At least three must be outside the major department, all at the 300 or 400 level. Specific procedures and requirements for graduate students vary within the broad framework set by the Graduate School and the Graduate Faculty Senate. Students should always consult the director of graduate studies in their major department.

Mathematics

College of Arts and Science
202 Mathematical Sciences Building
(573) 882-6221

FACULTY

Elias Saab, chair, professor, PhD, University of Illinois at Urbana-Champaign. Functional analysis.
Nakhle Asmar, director of graduate studies, professor, PhD, University of Washington. Harmonic analysis.
Calvin D. Ahlbrandt, professor, PhD, University of Oklahoma. Commutative algebra.
Mark S. Ashbaugh, professor, PhD, Princeton University. Mathematical physics.
John K. Beem, professor, PhD, University of Southern California. Differential geometry.
Peter G. Cassaza, professor, PhD, University of Iowa. Functional analysis.
Carmen C. Chicone, professor, PhD, University of Wisconsin. Dynamical systems.
Steven D. Cutkosky, professor, PhD, Brandeis University. Algebraic geometry.
Friedrich Gesztesy, professor, PhD, University of Graz. Partial differential equations.
Steve Hofmann, professor, PhD, University of Minnesota. Harmonic analysis.
James A. Huckaba, professor emeritus, PhD, University of Iowa. Commutative rings.
Nigel J. Kalton, curator's professor, PhD, Cambridge University. Functional analysis.
Alexander Koldobsky, professor, PhD, Leningrad State University. Fourier and Functional Analysis.
L. Jerome Lange, professor emeritus, PhD, University of Colorado. Complex analysis.
Yuri Latushkin, professor, PhD, Odessa University. Dynamical systems.
Ira J. Papick, professor, PhD, Rutgers University. Commutative algebra.
Dix Pettey, professor, PhD, University of Utah. Point set topology.
Clinton M. Petty, professor emeritus, PhD, University of Southern California.
Paulette Saab, professor, PhD, University of Illinois at Urbana-Champaign. Functional analysis.
Keith W. Schrader, professor, PhD, University of Nebraska. Differential equations.
F. Dennis Sentilles, professor, PhD, Louisiana State University. Functional analysis.
Hema Srinivasan, professor, PhD, Brandeis University. Commutative algebra.
W. Roy Utz, professor emeritus, PhD, University of Virginia.
Joe Zemmer, professor emeritus, PhD, University of Wisconsin.
Zhongxin Zhao, professor, PhD, Fudan University. Probabilistic analysis.
Ian Aberbach, associate professor, PhD, University of Michigan. Commutative algebra.
Richard Crownover, associate professor emeritus, PhD, Louisiana State University. Complex analysis.
Loukas Grafakos, associate professor, PhD, University of California-Los Angeles. Harmonic analysis.
Adam Helfer, associate professor, PhD, Oxford University. Geometry, mathematical physics.
Steven Montgomery-Smith, associate professor, PhD, Cambridge University. Functional analysis.
Michael Pang, associate professor, PhD, London University. Elliptical differential equations.
Zhenbo Qin, associate professor, PhD, Columbia University, Algebraic Geometry.
John H. Reeder, associate professor, PhD, Northwestern University. Differential equations.
Jan Segert, associate professor, PhD, Princeton University. Mathematical physics.
Igor Verbitsky, associate professor, PhD, Kazan University. Harmonic analysis, PDE.
Shuguang Wang, associate professor, PhD, Oxford University. Guage theory.
Dana Weston, associate professor, PhD, University of Illinois. Commutative algebra.
Qi Zhang, associate professor, PhD, Duke University. Algebraic geometry.
Tanya Christiansen, assistant professor, PhD, MIT. Scattering theory.
Stamatis Dostoglou, assistant professor, PhD, University of Warwick. Mathematical physics.
Dan Edidin, assistant professor, PhD, MIT. Algebraic geometry.
Yanguang Li, assistant professor, PhD, Princeton University. Dynamical Systems, PDE.
Dan Lieman, assistant professor, PhD, Brown University. Number theory, automorphic forms.
Dorina Mitrea, assistant professor, PhD, University of Minnesota. Harmonic analysis, PDE.
Marius Mitrea, assistant professor, PhD, University of South Carolina. Harmonic analysis, PDE.

DEGREES: MS in applied mathematics and MA, MST and PhD in mathematics

DUAL DEGREE: MS in applied mathematics and economics

To be accepted for advisement a candidate must submit three letters of recommendation and an undergraduate transcript to be evaluated by the department. While a bachelor's degree from an accredited institution is required, the undergraduate major need not be mathematics as long as applicants have had sufficient mathematics training to qualify for 400-level courses during the first three semesters of graduate work.

About 65 graduate students, of whom one-third are post-master's, are currently in the department and nearly all are supported financially. Scholarships, assistantships, fellowships and other sources of aid are available. The De-

partment Research Fellowship, the Blumenthal Scholarship and the McFarlan Fellowship are administered by the department while the Huggins Scholarship, Gregory Fellowship and Ridgel Fellowship are university-wide.

Applicants to the dual master's program may submit a formal application to the master's program in either the Department of Mathematics or the Department of Economics. In addition, a letter requesting consideration for the dual master's program must be sent to both departments.

For information and applications write to Director of Graduate Studies in Mathematics, 202 Mathematical Sciences Building, Columbia, MO 65211.

All candidates for the master of arts, the master of science for teachers, or the master of science in applied mathematics must complete either a thesis or independent project and must be examined by an examining committee of three faculty members appointed by the director of graduate studies in consultation with the student's adviser.

THE MASTER OF ARTS: The degree requirements include the satisfactory completion of 30 hours of approved course work, of which at least 18 hours must be at the 400 level. Math 404, 413, 432 and 468 are required. Students are expected to make up any required deficiencies in their undergraduate training in advanced calculus and abstract algebra. Students may list no more than two of the courses 302, 310, 311, 331, 340 and 341 on their graduate program. Furthermore, neither 304 nor 333 may be listed.

THE MASTER OF SCIENCE FOR TEACHERS: This degree is designed primarily for those who want to teach mathematics at the secondary school level. A candidate for the degree must have a valid teaching certificate before entering the program and must satisfactorily complete 30 hours of approved course work. At least 12 credit hours besides 489 Master's Project must be at the 400 level and must include six credit hours from the department. At least two courses are required in the fields of algebra, analysis and geometry/topology.

THE MASTER OF SCIENCE IN APPLIED MATHEMATICS is designed to give students training in those areas of mathematics used frequently in applications. A candidate must satisfactorily complete 30 hours of approved course work, at least 15 hours of which must be in 400-level courses. Math 404, 407, 413 and 426 are required. At least three hours of the 30 hours must be taken outside the department. Additional requirements (some of which may be satisfied by work done as an undergraduate) include the completion of one year of advanced calculus and at least one approved course in each area of linear algebra, numerical analysis and mathematical statistics or probability. Students may list no more than two of the courses 302, 310, 311, 331, 340 and 341 on their graduate program. Furthermore, neither 304 nor 333 may be listed.

DUAL MASTER'S DEGREE IN APPLIED MATHEMATICS AND ECONOMICS: The departments of mathematics and economics offer selected students the option of obtaining both an MS degree in applied mathematics and an MA degree in economics within an integrated program. Minimum requirements for acceptance into the dual master's program include economics instruction through intermediate microeconomic theory, intermediate macroeconomic theory, and intermediate econometrics, and mathematics instruction through three semesters of calculus, and two semesters of advanced calculus or abstract algebra. Under exceptional circumstances, students with more limited training may be accepted into the program and required to undertake remedial instruction.

Core requirements for the dual master's program include 33 hours of course work as follows: Math 404 or 440, 407, 408 or 413 or 441, 426, 489. Economics 405, 453, 473, 413, 400/490, and two 400-level economics electives.

Students are required to complete an MA paper in economics (normally undertaken in Economics 413) and a master's project in mathematics (in Mathematics 489). Students are encouraged to undertake a single project that will satisfy both requirements.

THE DOCTOR OF PHILOSOPHY: This is a professional research degree designed to prepare students for various advanced professional careers, including college teaching and research. Before formally becoming a candidate, a student must have training equivalent to that required for a master's degree and must pass a qualifying examination after beginning work at MU. In addition, the candidate must give evidence of reading proficiency in two foreign languages, complete a course of study approved by the doctoral program committee and pass a comprehensive examination.

The active areas of research interest of the current members of the staff are: algebraic geometry, analysis (real, complex, functional and harmonic), analytic functions, applied mathematics, commutative rings, control theory, convexity, differential equations (ordinary and partial), differential geometry, dynamical systems, general relativity, mathematical physics, numerical analysis, probabilistic analysis and topology.

COURSES

101—Selected Topics in Mathematics (1-3). The special topics covered may vary from term to term. This course may be repeated. Prerequisite: departmental consent.

201—Calculus III (3). Vectors, solid analytic geometry, calculus of several variables. Prerequisite: grade of C or better in 175 or equivalent training. cor.

205—Calculus for Business & Economics (3). Introduction to elementary analytic geometry, functions, differential calculus and integral calculus with particular emphasis on topics of interest to students in business and economics. No credit for students who have completed a calculus course. Prerequisites: C in 10 or equivalent and graduate standing.

208—Calculus for Social and Natural Sciences II (3). Riemann integral, transcendental functions, techniques of integration, improper integrals and functions of several variables. No credit for students who have completed two calculus courses. Prerequisites: 61 or 108 or 205.

226—Discrete Mathematical Structures (3). Basic set theory, groups, semigroups, Boolean algebra, graph theory and combinatorics. Applications oriented toward computer science. Prerequisites: one of 175 or 260 or 233.

233—Algebraic Stuctures (3). Introduction to axiomatic mathematics with emphasis on rings and groups. Applications to elementary number theory. Prerequisite: 67 and one of 61 or 231.

250—Elementary Logic and Set Theory (3). Introduction to logic, set theory, denumerable and nondenumerable sets, and cardinal arithmetic. Prerequisites: one of 201, 231 or 233.

260—Geometric Axioms and Structures for Teachers (3). Euclidean Geometry, Axiom systems, spherical geometry, finite geometries, and explorations with technology. Prerequisite: 67 or 68.

298—Honors (2). Special work for senior A.B. Honors and B.S. Honors candidates.

299—Honors (2). Special work for senior A.B. Honors and B.S. Honors candidates.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: 201 and instructor's consent, departmental consent for repetition.

302—Advanced Calculus With Applications (3). Linear mappings, Jacobi matrices and determinants, change of variables, vector fields, line and surface integrals, theorems of Green, Gauss and Stokes, sequences and series of functions, uniform convergence, special functions. Prerequisite: 201.

304—Differential Equations (3). Traditional introductory course in ordinary differential equations. Includes 1st and 2nd order linear differential equations with numerous applications; Laplace transforms; power series solutions; numerical methods, linear systems. Prerequisite: 201.

305—Introduction to Complex Variables (3). Complex functions, contour integration, power series, residues and poles, conformal mapping. Prerequisites: 302 or 310.

307—Numerical Analysis (3). (same as Computer Engineering and Computer Science 307). Machine arithmetic, approximation and interpolation, numerical differentiation and integration, nonlinear equations, linear systems, differential equations, error analysis. Selected algorithms will be programmed for solution on computers. Prerequisites: 201 and the ability to program in high-level, language such as Fortran Pascal, or C.

308—Numerical Linear Algebra (3). (same as Computer Engineering and Computer Science 308). Solution of linear systems of equations by direct and iterative methods. Calculation of eigenvalues and eigenvectors of matrices. .Selected algorithms programmed for solution on computers. Prerequisites: 201, and the ability to program in a higher level language such as Fortran, Pascal, or C. Recommended: 331

309—Applied Analysis (3). Solution of the standard partial differential equations (wave, heat, Laplace's eq.) by separation of variables and transform methods; including eigenfunction expansions, Fourier and Laplace transform. Boundary value problems, Sturm-Liouville theory, orthoganlity, Fourier, Bessel, and Legendre series, spherical harmonics. Prerequisite: 304

310—Advanced Calculus I (3). Basic topology of the real line, numerical sequences and series, properties of continuous functions, differentiation, Riemann-Stieltjes integration, uniform convergence. Prerequisite: 201. Recommended: 331 and one other mathematics course numbered above 201.

311—Advanced Calculus II (3). Power series, elementary topology of Euclidean spaces, functions of several variables, implicit functions, partial differentiation, integration theory. Prerequisite: 310 or equivalent.

316—Fractals and Chaos (3). Self-similar fractals, iterated function systems, chaotic behavior of simple dynamical systems, fractal dimension, random fractals. Prerequisite: 304, 331, and the ability to program in a language such as Fortran, Pascal, or C.

320—Introduction to Mathematical Statistics (3). (same as Statistics 320). Introduction to theory of probability and statistics using concepts and methods of calculus. Prerequi-

sites: Mathematics 201 or instructor's consent. f,w.

325—Introduction to Probability Theory (3). (same as Statistics 325). Probability spaces; random variables and their distributions; repeated trials; probability limit theorems. Prerequisites: Mathematics 201 or instructor's consent. f,w.

326—Statistical Inference I (3). (same as Statistics 326). Sampling; point estimation; sampling distribution; tests of hypotheses; regression and linear hypotheses. Prerequisite: 325. w,s.

327—Combinatorics (3). Study of a variety of topics from combinatorial mathematics, especially graph theory and enumerative combinatorics. Topics include graph coloring, matchings and coverings, generating functions, recurrence relations, Polya's Enumeration Theorem, introduction to Ramsey theory. Prerequisites: 226 or instructor's consent. w.

330—Theory of Equations (3). Study of polynomials and their zeros and elementary determinant and matrix theory. Prerequisites: 201 or 226.

331—Matrix Theory (3). Basic properties of matrices, determinants, vector spaces, linear transformations, eigenvalues, eigenvectors, and Jordan normal forms. Introduction to writing proofs. Prerequisite: one of 201, 226, 231, or 233.

332—Linear Programming (3). Linear dependence and rank in vector spaces in Rn, Farkas' Lemma, Polyhedral Decomposition. Strong duality and complementary theorems. The simplex method, revised simplex, and sensitivity analysis. Primal Dual simplex method and network simplex methods. Computational Complexity and Karmarkar's Algorithm. Prerequisites: 324 or 331 or instructor's consent.

333—Higher Algebra (3). Introduction to rings, integral domains, fields, groups. Prerequisites: 201 or 226.

335—Theory of Numbers (3). Factorization, Euler phi-function, congruences, primitive roots. Prerequisites: 201 or 226.

340—Introduction to Abstract Algebra I (3). Introduction to groups, rings, linear algebra, and fields; special emphasis on groups and elementary properties of rings. Prerequisite: 201. Recommended: 331 and one other mathematics course numbered above 201.

341—Introduction to Abstract Algebra II (3). Continuation of 340. Special emphasis on rings, vector spaces, and fields. Prerequisite: 340.

349—Applied Modern Algebra (3). (same as Computer Engineering and Computer Science 349). Introduction to modern algebra; emphasis on applications to computer science, engineering, related subjects. Basic concepts of modern algebra applied to computer design. Prerequisites: 201 or 226 and the ability to program in a higher level language such as Fortran, Pascal, or C.

350—Special Readings (1-3). Prerequisites: 201 and instructor's consent.

355—History of Mathematics (3). Includes Greek mathematics and the invention of the calculus with emphasis on the mathematical aspects of topics studied. Prerequisite or corequisite: one of 201 or 233.

358—Mathematical Logic (3). Introduction to classical modern logics as deductive systems; applications to foundations of mathematics. Prerequisites: junior or senior standing and interest and background in Mathematics or Philosophy.

360—College Geometry (3). Euclidean geometry from an advanced viewpoint. Synthetic and coordinate methods will be used. The Euclidean group of transformations will be studied. Prerequisite: 201.

362—Projective Geometry (3). Basic ideas and methods of projective geometry built around the concept of geometry as the study of invariants of a group. Extensive treatment of collineations. Prerequisite: 201.

366—Foundations of Geometry (3). Coordination of affine, projective planes by means of various kinds of algebraic structures: planar ternary rings, Veblen-Wedderburn systems, divisions rings, skew fields, and fields. Prerequisite: 201.

367—Introduction to Non-Euclidean Geometry (3). Account of rise, development of non-Euclidean geometries. Intensive study of plane hyperbolic geometry. Prerequisite: 201.

372—Introduction to Topology (3). Topics from topology of Euclidean spaces, generalizations to metric spaces and topological spaces. Fundamentals of point set topology. Prerequisite: 201.

390—Senior Seminar (3). Seminar with student presentations, written projects, and problem solving. May be used for the capstone requirement. Prerequisite: 12 hours of mathematics courses numbered 300 or above.

395—Mathematics Problem Solving (3). Creative advanced problem solving bringing together methods such as integration, probability and Euclidean geometry. Prerequisite: 331 and another 300 level Mathematics course, or instructor's consent.

400—Problems (1-3).

404—Theory of Functions of Real Variables I (3). Properties of functions of one real variable. Lebesgue measure and integration on the line. Prerequisites: 310 and 311, or equivalent.

405—Theory of Functions of Real Variables II (3). Continuation of 404. Lp spaces, general measure and integration theory. Prerequisite: 404.

407—Partial Differential Equations I (3). Fourier and integral transforms, first and second order partial differential equations, methods of characteristics, Laplace's equation, Direchlet and Neumann problems, Green's functions and maximum principles. Prerequisite: 309 or instructor's consent.

408—Partial Differential Equations II (3). The Cauchy-Kovalevski theorem, the Lewy example, the heat operator, the wave operator, Sobolev spaces, local regularity of elliptic boundary value problems. Prerequsitie: 407, and 404 recommended.

409—Functional Analysis I (3). Linear topological spaces, Banach spaces, Hilbert spaces. Operator theory, including the Hahn-Banach, uniform boundedness and closed graph theorems. Prerequisite: 404.

410—Functional Analysis II (3). Topological vector spaces, duality theory, Banach algebras.

412—Calculus of Variations I (3). Development of necessary conditions and of sufficient conditions for nonparametric and parametric problems. Hamilton's principle, related topics. Prerequisite: instructor's consent.

413—Complex Analysis I (3). Rigorous introduction to the theory of functions of a complex variable. Prerequisite: 311 or equivalent.

414—Complex Analysis II (3). Analytic continuation, Riemann surfaces, entire and meromorphic functions, selected topics. Prerequisites: 413.

415—Harmonic Analysis I (3). An introduction to Fourier Analysis in one and higher Dimensions. Topics include Fourier Series, conjugate functions, Fourier transforms, distributions, interpolation, and maximal functions. Prerequisite: 404

416—Harmonic Analysis II (3). Singular integrals, Littlewood-Paley theory, Hardy spaces, bounded mean oscillation, weighted norm inequalities, boundary value problems, and analysis on groups. Prerequisite: 415.

418—Nonlinear Differential Equations (3). Existence theorems; criteria for periodic solutions; boundedness of solutions; perturbation theory. Emphasizes second order equations. Prerequisites: 304 and 302 or 310.

420—Topological Dynamics (3). Periodicity and its generalizations in dynamical systems. Prerequisite: 404.

422—Numerical Solution of Partial Differential Equations (3). Study of finite difference and finite element methods for solving partial differential equations. Prerequisites: 331, 302, or 310; or instructor's consent.

423—Advanced Numerical Analysis (3). Analysis and implementation of numerical algorithms selected from approximation theory, splines, quadrature, nonlinear systems, ordinary differential equations, and optimization. Prerequisites; 310, 323 or equivalent, 331.

424—Advanced Numerical Linear Algebra (3). Advanced techniques for solving systems of linear equations, least squares problems, and eigenvalue problems. Analysis of stability of algorithms. Discussion of both full and sparce matrices. Prerequisites: 310, 323, or 324, 331 or instructor's consent.

426—Advanced Ordinary Differential Equations I (3). Topics from existence and uniqueness theorems, plane autonomous systems, periodicity and boundedness of solutions of second order nonlinear equations, perturbation theory, Sturm-Liouville systems, behavior of solutions at singularities. Prerequisite: 310 or equivalent.

427—Advanced Ordinary Differential Equations II (3). Continuation of 426.

430—Topics From Algebra (1-99). Prerequisite: instructor's consent.

432—Algebra I (3). Theory of algebraic structures—groups, rings, fields, algebraic and transcendental extensions of fields. Prerequi- sites: 340 and 341, or equivalent.

433—Algebra II (3). Theory of modules, Galois theory and additional topics to be selected by the instructor. Prerequisite: 432 or equivalent.

434—Topics in Algebra (3). Advanced topics in algebra. Prerequisite: 432.

435—Algebraic Geometry I (3). Affine and projective varieties and schemes; nullstellensatz; Zariski topology, morphisms and rational maps; divisors and linear systems; topics from curves, surfaces, Grassmann varieties; commutative algebra and homological algebra as needed. Prerequisite: 432.

436—Algebraic Geometry II (3). Continuation of 435. Prerequisite: 435.

440—Advanced Probability (3). (same as Statistics 440). Measure theoretic probability theory. Characteristic functions; conditional probability and expectation; sums of independent random variables including strong law of large numbers and central limit problem. Prerequisites: 325 or 401, and 406; or instructor's consent.

441—Stochastic Processes (3). (same as Statistics 441). Markov processes, martingales, orthogonal sequences, processes with independent and orthogona increments, stationarity, linear prediction. Prerequisite: 440.

445—Advanced Mathematics for the Physical Sciences (3). Study of selected topics in quantum and statistical mechanics. Schrodinger operators and their self-adjointness. Semi-classical methods and their application to estimation of eignevalues. Partition functions in many body problems and methods ofestimation. Prerequisites: instructor's consent, Mathematics 302, 310 or Physics 446 recommended.

448—Topics in Numerical Mathematics (1-99.9). Prerequisite: instructor's consent.

449—Topics in Applied Mathematics (1-99.9). Selected topics in applied mathematics drawn from variety of areas: partial differential equations, tensor analysis, calculus of variations, asymptotic methods, integral equations, advanced theory of transforms and distributions, numerical analysis.

456—Differentiable Manifolds and Riemannian Geometry (3). Tensor product spaces and tensor fields on manifolds. Differentiation and integration of differential forms. Riemannian geometry and applications. Prerequisites: 310 or 372.

457—Differential Geometry for Scientists and Engineers (3). Tensors and multilinear forms. Connections, covariant differentiation, geodesics and curvature on Riemannian and pseudo Riemannian manifolds. Applications to special relativity and general relativity. Prerequisites: 302 and some knowledge of Matrix Theory.

458—Differential Geometry I (3). Metric properties of restricted portions of curves and surfaces in three-dimensional Euclidean space. Prerequisite: 201.
460—Topics of Geometry (1-99). Prerequisite: instructor's consent.
468—General Topology I (3). Introduction to axiomatic theory of general topology. Continuous functions and homeomorphisms. Convergence in abstract topological spaces. Compact and locally compact spaces. Connectedness. Metrizable spaces. Prerequisites: 311 or 372 or instructor's consent.
469—General Topology II (3). Continuation of 468. Product spaces and Tychonoff's theorem. Introduction to homotopy theory. Fixed point theorems. Prerequisite: 468.
470—Introduction to Algebraic Topology (3). Development of singular homology theory; reference to other homology and cohomology theories. Introduction to homological algebra. Prerequisite: 468.
479—Topics in Topology (1-99). Advanced topics in topology or topological algebra.
480—Analysis Seminar (1-99).
482—Algebra Seminar (1-99).
484—Geometry Seminar (1-99).
486—Topology Seminar (1-99).
487—Numerical Mathematics Seminar (1-99).
488—Applied Mathematics Seminar (1-99).
489—Masters Project (3). Students will be required to complete an independent thesis. Topics are chosen in consultation with a faculty advisor and are subject to departmental consent.
490—Research (1-99). Graded on a S/U basis only.

Mechanical and Aerospace Engineering

College of Engineering
E2412 Engineering Building East (573) 882-2785

FACULTY

Robert Tzou, chair, professor, PhD, Lehigh University. High-rate, small-scale heat transfer and the associated failure in electronic materials, thermo-mechanical modelling for material damage, and brittle and ductile fracture mechanics.

Uee Wan Cho, director of graduate studies, associate professor, PhD, Brown University. Solid and applied mechanics, materials science, structural and stress analysis, creep, plasticity, and fracture mechanics.

C. Quinton Bowles, associate dean, professor, PhD, University of Delft, Holland. Metallurgy, fracture mechanics, scanning and transmission electron microscopy, mechanical behavior of materials.

William L. Carson, professor, PhD, University of Iowa. Mechanics, instrumentation, biomechanics, dynamics, controls, and design.

Roger C. Duffield, professor, PhD, University of Kansas. Vibrations, solid mechanics, structural mechanics, structural and systems dynamics.

Aaron D. Krawitz, professor, PhD, Northwestern University. Materials science, physical metallurgy, X-ray and neutron diffraction, and composites.

William E. Stewart, professor, PhD, University of Missouri-Rolla. Experimental and numerical heat transfer, free convection from solids, heat generating porous media; freezing/thawing problems in cold climates, ice and ice adhesion.

Bryan R. Becker, associate professor, PhD, University of Tennessee. Numerical analysis of heat transfer and fluid flow phenomena utilizing both finite element and finite difference techniques, fluid dynamics, heat transfer, thermodynamics, turbulence, atmospheric science.

A. Sherif El-Gizawy, associate professor, PhD, University of Waterloo, Canada. Manufacturing design, process modeling, integrated computer-aided manufacturing, and expert systems applications in manufacturing.

Yuyi Lin, associate professor, PhD, University of California-Berkeley. Dynamics and control of mechanisms, flexible structures and robotics, mechanical design optimization and automation.

Satish S. Nair, associate professor, PhD, The Ohio State University. Dynamic modeling and control of systems, robust, adaptive, neural network, and intelligent control, mechatronics, manufacturing and automation, and design.

Steven P. Neal, associate professor, PhD, Iowa State University. Ultrasonic nondestructive evaluation, ultrasonic tissue characterization, and solid mechanics.

P. Frank Pai, associate professor, PhD, Virginia Tech. Computational structural mechanics, composite and smart structures, structural health monitoring, nonlinear finite elements, deployable structures, modern nonlinear dynamics, and larger deformation processing.

Robert A. Winholtz, associate professor, PhD, Northwestern University. Residual stresses, neutron and x-ray measurement of residual and applied stresses, composite and two phase materials.

Y. Kevin Chou, assistant professor, PhD, Purdue University. Metal cutting, machining processes, hard turning, high speed machining, material characterization, microstructural evolution, tool wear and surface integrity.

Roger Hill, assistant professor, PhD, University of Texas, Austin. Computational fluid dynamics and heat transfer, direct numerical simulation of transitional and turbulent flows.

Craig A. Kluever, assistant professor, PhD, Iowa State University. Guidance and control of aerospace vehicles, orbital mechanics, spacecraft and mission design, and trajectory optimization.

Ehud Kroll, assistant professor, DSc, Technion-Israel Institute of Technology. Design theory and methodology, concurrent engineering, design for manufacturing, assembly and disassembly, computer applications in design.

Oleg Vasilyev, assistant professor, PhD, University of Notre Dame. Computational fluid mechanics, wavelet methods for the solution of partial differential equations, large eddy simulation of turbulent flows.

DEGREES: MS and PhD in mechanical and aerospace engineering

Information on degree requirements for engineering licensure is detailed under **Professional Engineering Registration**.

Graduate programs are planned to prepare students for advanced professional engineering careers. In recognition of the broad nature of the field of mechanical and aerospace engineering, considerable latitude in programs is encouraged, so students may prepare for employment in industry, education and government.

A student may pursue an area of concentration selected from AI/expert systems, automation, bioengineering, combustion, control, creep and plasticity, design optimization, finite and boundary element methods, fluid and aerosol mechanics, fracture mechanics, heat transfer, interactive computer graphics, laser diagnostics, manufacturing systems, materials science, mechanical syntheses, mechatronics, microprocessor applications, orbital mechanics, parallel computation, residual stress, robotics, thermal systems design, ultrasonic nondestructive evaluation, and vehicle dynamics.

The department has several specialized laboratories in aerosol mechanics, combustion, computer control, creep and fracture mechanics, fluid mechanics and heat transfer, manufacturing and materials science.

Besides the modern instrumentation and equipment normally found in well-equipped mechanical and aerospace engineering laboratories, the department has, or has access to, such specialty items as MTS and Instron material and structural test equipment, wind tunnels, X-ray and a scanning electron microscope facility, computer control systems, a scanning laser vibrometer and the university research reactor. The Engineering Computer Network (ECN) provides advanced engineering computation for College of Engineering faculty and students. CAD/CAM and graphics are the primary emphasis, although artificial intelligence, multiple high-level programming languages, and computational and simulation libraries also are available. The ECN operates one high performance enterprise server, two super minicomputers and 17 HP workstations. The ECN also provides hardware/software support, locally, to nine College of Engineering departments and their affiliated research centers. Remote support is provided for the college's Coordinated Engineering Program located at UMKC. These units are networked via ethernet to the super minicomputers operated by the ECN. The ECN operates two remote terminal sites in Engineering Buildings East. The University also supports an extensive computer system consisting of IBM mainframe computers, remote terminal sites, PC and Macintosh labs throughout the campus.

Application forms and further information about the department can be obtained by writing the Director of Graduate Studies in Mechanical and Aerospace Engineering, E2412 Engineering Building East, Columbia, MO 65211.

MASTER'S DEGREE: The master of science degree in mechanical and aerospace engineering is open to students with a BS degree in the same or a closely related field.

An applicant with a GPA of at least 3.0 (A=4.0) or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record and three letters of recommendation. Lower GPAs require special action and substantiation, such as good test scores on the GRE or other recognized examinations. All applicants are required to take the GRE.

A program of study is developed by the student and the adviser, subject to approval.

The minimum degree requirement is 30 semester hours, including a special problem or a thesis project. A special problem consists of three to six hours of 400, with not more than six hours total of 300 (Problems) and 400 (Prob-

lems) for programs terminating in a report. Alternatively, programs directed toward a thesis shall include six to nine hours of 490. A thesis or a report is approved by designated faculty members and is deposited in the department libraries. Passing the MS final examination, administered by a faculty committee, fulfills the degree requirements.

DOCTORAL DEGREE program applicants are closely and individually reviewed. Minimum admission requirements include a strong record on the MS program and three letters of recommendation.

The usual purpose of a PhD program is to prepare a person for a career in research or teaching. The program is oriented toward research culminating in a dissertation suitable for publication.

A minimum of 72 semester hours are required including the credit hours taken during the MS program. Students who received the MS degree from other than MU may transfer a maximum of 30 hours from their MS coursework. A doctoral student must satisfy a special requirement, either proficiency in foreign languages or a collateral field. The collateral field requires a minimum of nine hours of coursework in one area other than MAE.

The PhD candidate plans a program of study and research under the immediate supervision of an adviser and in close cooperation with the doctoral program committee approved by the dean of the Graduate School upon the department's recommendation.

A qualifying examination is given soon after the student begins doctoral study. Successful completion of this examination is a prerequisite to formal acceptance into the PhD program. Students with an MS from MU or another accredited U.S. engineering program will be exempt from the qualifying examination, if their MS GPA and total GRE scores satisfy a departmental exemption rule. A comprehensive examination is given after all course work and language or collateral requirements have been satisfied. Upon completion of the program of study and research a final examination, essentially a defense of the dissertation, is administered.

A minor in materials sciences can be obtained at the MS or PhD level by students interested in the formal pursuit of knowledge in material sciences. Refer to the **Materials Science** section for more information.

COURSES

Course numbers followed by K are offered through the Coordinated Engineering Program at the University of Missouri-Kansas City.

201—Topics in Mechanical and Aerospace Engineering (3). Current and new technical developments in Mechanical and Aerospace Engineering. Prerequisite: instructor's consent.

201K—Fundamental Topics in Mechanical Engineering (1-3). Special engineering topics for undergraduate students. Prerequisite: instructor's consent.

206—Introduction to Computer-Aided Design (3). Application of design principles to the generation, analysis, synthesis, and optimization of mechanical components and systems. Prerequisites: CECS 103, Mathematics 304 concurrent.

206K—Computer-Aided Engineering (3). Principles of computer aided design. Analysis and application of numerical methods in computer-aided design of mechanical systems. Computer implementation. Prerequisites: ECE 116K and Mathematics 345.

209—Engineering Thermodynamics II (3). Gas and vapor mixtures, thermodynamic relations and properties, combustion, chemical equilibrium, analysis and design of thermodynamic systems. Prerequisite: grade of C or better in Engineering 99.

210—Introduction to Biomechanics (3). Introduces engineering topics applicable to areas of physical therapy, physical medicine, orthopedics. Student must have had basic courses in physics, chemistry, biology, algebra, and preferably trigonometry. May not be taken for credit by Engineering students.

215K—Feedback Control Systems (3). Introduction to feedback control theory for linear dynamic systems. Modeling, analysis and compensation techniques. Computer analysis. Prerequisite: ECE 124 and Mathematics 345. w.

224—Engineering Materials (4). The nature of the structure of engineering materials. The relationship of material structure to the physical properties. Mechanical behavior of engineering materials. Prerequisite: grade of C or better in Engineering 195; Chemistry 31.

224K—Engineering Materials (3). Crystal structure, imperfections and diffusion in materials, phase diagrams, kinetics and heat treatment and material selection for engineering design. Introduction to polymers and ceramics. Laboratory in crystallography, metallography, diffusion, heat treating of steels, precipitation hardening, hardness testing, phase diagrams. Prerequisites: Engineering 085K and 099K.

234—Engineering Materials II (3). Mechanical behavior of engineering materials. Fundamental response of materials to mechanical treatment in engineering designs. Prerequisites: 224, Engineering 195.

234K—Engineering Materials and Design (3). Mechanical behavior of materials and applications in design. Deformation mechanisms, complex states of stress, stress concentration factors, fracture mechanics, fatigue and crack growth, surface damage. Prerequisite: 224K and CE 195K. w.

236K—Engineering Materials and Design Laboratory (1). Mechanical testing and applications in design. Tensile tests, fracture toughness, charpy impact, total life fatigue testing. Prerequisites: 224K and 234K concurrently. w.

251—Fluid Mechanics (3). (same as Civil Engineering 251).Statics and dynamics of fluids, principles of continuity, momentum and energy. Boundary layers, dimensional analysis and drag are covered briefly. Thorough treatment of pipe flow. Prerequisite: 185; Engineering 99 concurrent.

251K—Thermofluid Mechanics (3). Concepts of the statics and dynamics of fluids, with emphasis on principles of continuity, momentum and energy. Boundary layers, dimensional analysis and drag covered briefly. Thorough treatment of pipe flow. Computer usage constitutes 25% of homework. Prerequisites: 185K and 099K concurrently. f.

252—Instrumentation and Measurements Laboratory I (3). Design and reporting of experimental investigations. Instrument design equations, sources of error, selection, and calibration. Survey of instruments to measure: volt, ohm, amp, time, frequency, displacement, velocity, acceleration, strain, force and torque. Prerequisites: Engineering 195, 185, Math 304. Engineering 124 concurrent.

252K—Instrumentation and Measurements Lab (3). Static and dynamic errors; experiment design; instrumentation selection and calibration; measurement of voltage, resistance, amperage, duration, frequency, displacement, velocity, acceleration, strain, force, torque. Prerequisites: MAE 185K, CE 195K, Math 345 and ECE 176K or concurrently.

256—Design of Machine Elements (4). Methodology of engineering design. Design and selection of mechanical elements to meet functional and environmental requirements. Prerequisites: MAE 185, and 224.

256K—Machine Design (3). Fundamentals presented in MAE 234K employed to design gears, shafts, belts, chain, clutches, brakes. Comprehensive design project consisting of several machine components required. Use or CAD facilities mandatory. Prerequisites: 185K, 234K, 236K and Engineering 30.

257—Automatic Control (3). Basic study of controller characteristics, feedback elements, compensation techniques, state space methods, analysis and synthesis of complete linear systems. Prerequisites: 285 and Mathematics 304.

260K—Thermal System Design I (3). Gas and vapor mixtures, cycles, availability, imperfect gases, thermodynamic relations, combustion, chemical equilibrium, power systems, and design, project. Prerequisites: 099K, 215K and Mathematics 250.

262—Instrumentation and Measurements Laboratory II (3). Continuation of 252 with emphasis on: instruments to measure temperature, pressure fluid flow, fluid velocity, sound, and computer data acquisition. Prerequisite: 252; 299 concurrent.

262K—Instrumentation and Measurements Lab II (3). Continuation of 252K with emphasis on instruments to measure temperature, pressure, fluid flow, fluid velocity, sound, spectral content and emissions. Prerequisites: MAE 251K, 252K. Corequisite: 299K.

276—Aerospace Structures I (3). (same as Civil Engineering 276).

280—Manufacturing Methods (3). Introduction to manufacturing processes with emphasis on those aspects most relevant to methods, problems in force analysis, and practicum and experimentation in machine tool applications. Prerequisite: 224, Engineering 30.

285—System Dynamics (3). Modeling, Analysis and Design of Dynamic Systems. Prerequisites: 185; Mathematics 304; Engineering 124 concurrent.

285K—Mechanical Systems Dynamics (3). Kinematic and dynamic analysis of multibody mechanical systems. Kinematic joints and constraints. Use and development of computer models. Prerequisites: 185K and Mathematics 345. f.

295—Design Synthesis I (3). Conceptual Design, Development of Design Methodologies, Design Project Reporting. Prerequisite: 256, 285, Statistics 320 or Engineering 132, 280 concurrent.

295K—Thermal Systems Design II (3). Thermal and fluid design of a complete system. Student projects. Prerequisites: 260K and 299K.

296—Design Synthesis II (3). Mechanical design including reliability, safety, manufacturing, economic and environmental constraints; design case studies; industrial design projects. Prerequisite: 295.

296K—Mechanical Design Synthesis (4). Synthesis procedures in mechanical and aerospace design; physical, economic and manufacturing constraints; modeling optimization; design case studies from industry; design projects. Seminar on professionalism and ethics. Prerequisite: 256K.

298K—Thermal Environmental Desing (3). Principles of thermodynamics, heat transfer, and fluid mechanics used to design for environmental heating and cooling loads, solar energy equipment, equipment size and system performance in maximizing human comfort. Design Projects. Prerequsites: 299K, 260K.

299—Heat Transfer (3). Fundamentals of conduction, convection and radiation. Use of nondimensional parameters. Theory and design of simple heat exchangers. Prerequisites: 251.

299K—Heat and Mass Transfer (3). Fundamentals of conduction, convection, radiation heat transfer. Use of nondimensional parameters. Theory of heat exchangers. Mass transfer. Prerequisites: 251K, Mathematics 345 or equivalent, MAE 206K or concurrently.

300—Problems (1-99.9). Special design, experimental and analytical problems in mechanical and aerospace engineering. Prerequisite: senior standing in Mechanical & Aerospace Engineering.

301—Topics in Mechanical and Aerospace Engineering (3). Current and new technical developments in mechanical and aerospace engineering. Prerequisite: instructor's consent.

303—Manufacturing Process Analysis (3). Methods and techniques used in process analysis, optimization and control. These include deterministic modeling (slab, upper bound and FEM), physical modeling techniques and statistical process control. Prerequisite: 280 or equivalent.

304—Digital Computer Applications in Engineering (3). (same as Chemical Engineering 304, Electrical Engineering 304).

306—Analysis of Mechanisms (3). Kinematics and dynamic (bearing force, shaking force, and time response) design analysis of mechanisms: graphical, analytical and computer assisted techniques. Prerequisites: MAE 206 and 185.

310—Introduction to Bioengineering (3). (same as Electrical Engineering 310).

314—Material Science for Advanced Applications (3). Study of the physical and mechanical metallurgy of alloy systems of interest in engineering applications. Prerequisite: 224.

315—Energy Systems & Resources (3). (same as Electrical Engineering 315, Nuclear Engineering 315).

318—Intermediate Dynamics (3). Introduction to advanced concepts in particle and rigid body dynamics. Topics include particle and rigid body kinematics in three-dimensions, moving coordinate systems and gyroscopic motion. Prerequisites: MAE/CE 185.

321—Creativity in Design (3). Identification and strengthening of attitudes and talents essential in design. Creative aspects and value considerations in design. Prerequisites: senior or graduate standing in Engineering.

324—Non-Metallic Engineering Materials (3). Structures, properties and applications of ceramics, glasses, polymers and composite materials. Prerequisite: 224.

326—Synthesis of Linkages (3). Type, number and dimensional synthesis of linkages to produce a given input-output motion and/or force. Prerequisites: 185, 206.

331—Experimental Methods in Fluid Flow and Heat Transfer (3). Laboratory experiments involving fundamental mechanisms and phenomena associated with fluid flow and heat transfer. Current experimental methods and techniques employed. Prerequisites: 262 & 299.

334—Diffraction Methods in Materials Science (3). Introduction to crystal structure and the use of x-rays and neutrons to study materials aspects including phase analysis, structure determination, residual stress and texture. Prerequisite: instructor's consent.

336—Interactive Computer Graphics in Engineering (3). Application of two and three dimensional interactive computer graphics techniques to visualize, analyze and solve engineering design problems. Prerequisite: 206.

337—Design of Thermal Systems (3). Thermal systems are simulated by mathematical models (often on a digital computer), followed by optimization. Supporting topics include: economics, heat transfer, thermodynamics, and optimization. Prerequisite: 299 w.

340—Heating and Air Conditioning (3). General principles of thermal science applied to the design of environmental control systems. Topics covered include heating and cooling load calculations, annual operating and life cycle cost estimating, duct and pipe sizing, and equipment selection. Prerequisites: 209 and 299

341—Intermediate Fluid Mechanics (3). Topics in potential and viscous flow theory, and computational fluid dynamics. Prerequisite: MAE/CvE 251.

342—Introduction to Computational Fluid Dynamics and Heat Transfer (3). Introduction to the principles and development of the finite- difference approximations to the governing differential equations of viscous and inviscid fluid flow, as well as heat transfer. Introduction to discretization methods and the calculation of flow fields, convection, diffusion and conduction. Prerequisites: MAE 251, 299 and 341.

344—Composite Materials (3). A survey of composite materials used in engineering emphasizing fiber-reinforced composites but including laminate and particulate composites. Prerequisite: 224 or equivalent.

345—Pipeline Engineering (3). (same as Civil Engineering 345). Theoretical and practical aspects of pipeline engineering including pipeline transport of natural gas and various solids such as coal, sand and solid wastes. Prerequisites: 251 and/or Civil Engineering 251.

346—Introduction to Nuclear Reactor Engineering I (3). (same as Nuclear Engineering 346). slowing down; steady-state and time dependent theory; reactor control; energy removal. Prerequisites: Mathematics 304 or instructor's consent.

350—Honors Research (1-99.9). Independent investigation to be presented as an undergraduate honors thesis. Prerequisite: Honors student in Mechanical & Aerospace Engineering.

351—Power Plant System Design (3). Preliminary component and system design. Optimum design of boilers, steam turbines, condensers and cooling towers and their integration into a system to minimize production costs and impact on the environment. Prerequisites: 209 and 299.

352—Advanced Mechanics of Materials (3). (same as Civil Engineering 352).

354—Nondestructive Evaluation of Materials (3). The role of nondestructive evaluation (NDE) in engineering is explored. Ultrasonic NDE is studied in detail. Labs are used to support the study of ultrasonic NDE. Other NDE techniques are surveyed. Prerequisite: 224 or equivalent.

356K—Digital Control of Mechanical Systems (3). (same as ECE 356K). The course presents an introduction to digital control systems. Topics include z-transforms, sampling, stability analysis, and digital controller design. Prerequisites: Differential Equations, MAE 215K or ECE 258K.

357—Mechatronic System Design (3). Synergistic combination of control, sensors, actuators, electronics, computers, and real-time programming. Actuator and computer fundamentals; logic devices; electronic components including transistors, operational amplifiers and power amplifiers; interface design and control programming. Prerequisites: MAE 257 or instructor's consent.

357K—Automatic Control Systems (3). (same as ECE 358K). Introduction to modern control theory and applications, multiple input/output control systems and contrallability and observability of linear systems. Prerequisites: Math 345, MAE 215K or ECE 258K.

360—Internal Combustion Engines (3). Gas and oil engines. Thermodynamics of ideal and actual cycles, fuels and combustion, carburetor and injection systems, performance, construction. Prerequisite: 251.

361—Gas Dynamics (3). One dimensional compressible flow with and without friction and heat transfer. Isentropic flow and shock phenomenon in nozzles and diffusers. Prerequisites: 251.

365—Automotive Engineering (3). Principles of design, construction, operating characteristics of automotive vehicles. Selected design problems, review of current developments. Prerequisite: 256 or concurrent.

366—Applied Mechanical Optimization (3). Introduction to mathematical programming techniques and applications to the design of mechanical systems and components. Prerequisite: 206.

371—Applied Robotics in Production (3). (same as Industrial and Manufacturing Systems Engineering 371).

372—Integrated Production Systems (3). (same as Industrial and Manufacturing Systems Engineering 372).

375—Introduction to Plasmas (3). (same as Nuclear Engineering 375, Electrical Engineering 375).

376—Machine Tool Design (3). Methodology of machine tool design. Dynamic modeling, analysis, and simulation of machine tools to meet functional requirements and design constraints. Prerequisites: 185 and 206.

379—Particulate Systems Engineering (3). An introduction to natural and engineered particulate systems. Prerequisite: Chemical Engineering 234.

381—Aerodynamics (3). Presents fundamentals of wing and airfoil theory for incompressible flow, including fluid kinematics and dynamics, potential flow, flow about a body, thin-airfoil theory, and finite wing. Prerequisites: 206 and 251 or CvE 251.

382—Lasers and Their Applications (3). (same as Electrical & Computer Engineering 382, Nuclear Engineering 382). Principles of laser operation, characteristics of gas, doped insulator, semiconductor and dye lasers, areas of application and laboratory demonstrations and experiments.

385—Vibration Analysis (3). (same as Civil Engineering 385). Vibration theory and its application to Mechanical systems. Topics include free and forced vibration analysis of single and multi-degree of freedom systems. Prerequisite: MAE/CE 185 and Math 304.

386—Introduction to Finite Element Methods (3). The application of matrix operations, energy concepts and structural mechanics to the development of the finite element method. Application of finite element method to beams, frames and trusses. Prerequisites: Engineering 195 and MAE 206.

389—Intermediate Thermodynamics (3). Topics from classical and statistical thermodynamics. Prerequisite: 209.

391—Combustion Fundamentals (3). Introduction to combustion principles. Prerequisites: 209 and 299.

395—Vehicle Dynamics (3). Analysis and prediction of the dynamic behavior of ground vehicles utilizing computer simulation. Mechanics of various suspension systems, tire-roadway interaction, vehicle aerodynamics, vehicle handling and steering characteristics. Special topics including nonholonomic constraint formulation and stability of motion. Prerequisite: 285.

399—Intermediate Heat Transfer (3). Advanced topics in conduction, convection, and radiation. Heat exchanges and their applications will also be analyzed. Prerequisite: 299.

400—Problems (1-99.9). Supervised investigation in mechanical and aerospace engineering to be presented in the form of a report.

401—Advanced Topics in Mechanical and Aerospace Engineering (3).

403—Manufacturing Design (3). Design for manufacture methods, their capabilities and applications. Design of intelligent manufacturing systems using sensory systems and artificial intelligence techniques. Prerequisites: 206, 280 or instructor's consent.

404—Physical Metallurgy (3). Treatment of fundamentals of physical metallurgy, including metallurgical thermodynamics, macroscopic and atomic diffusion, interfaces, nucleation, solidification theory, and solid state transformations. Prerequisite: 224 or equivalent.

407—Adaptive Control (3). Adaptive systems, stability theory, identification and control problems, model reference adaptive systems, self tuning regulators, adaptive observers, persistent excitations robust adaptive control, case studies. Prerequisites: 257 or equivalent; 408 or instructor's consent.

408—State Variable Methods in Automatic Control (3). (same as Chemical Engineering 408, Electrical & Computer Engineering 408, Nuclear Engineering 408).

410—Seminar (1). Reviews recent investigations, projects of major importance in mechanical and aerospace engineer-

ing. Graded on S/U basis only.

411—Continuum Mechanics (3). (same as Civil Engineering 411).

412—Theory of Elasticity (3). (same as Civil Engineering 412).

413—Theory of Plates and Shells (3). (same as Civil Engineering 413).

414—Theory of Elastic Stability (3). (same as Civil Engineering 414).

415—Aeroelasticity (3). Deformations of aerospace structures under static and dynamic loads, natural mode shapes and frequencies, aerodynamic and inertial loads, flutter analysis, dynamic response phenomena, and critical speeds and frequencies. Prerequisites: 286 and 390.

416—Theory of Plasticity (3). (same as Civil Engineering 416).

417—Intelligent Control (3). Nonlinear control design including stability and convergence, need for knowledge based techniques. Neural networks for identification and control of dynamic systems, static and dynamic back propagation. Fuzzy logic controller design, self tuning. Case studies. Prerequisites: 257 and 408.

418—Advanced Dynamics (3). (same as Civil Engineering 418).

427—Robust Control (3). Definition of the robust performance problem with the goal of achieving specified signal levels in the face of plant uncertainity; uncertainty and robustness, stabilization, design constraints, loopshaping, model matching and design for robust performance. Prerequisites: 257, and 408 or instructor's consent.

428—Vibrations of Distributed Parameter Systems (3). (same as Civil Engineering 428).

430—Boundary Layer Theory (3). Fluid motion at high Reynolds Number. Derivation of Navier-Stokes equations and boundary layer equations. Methods of solution. Transition to turbulent flow. Completely developed turbulent flow. Prerequisite: 341.

433—Statistical Thermodynamics (3). Statistical methods of evaluating thermodynamic properties. Elements of quantum mechanics, statistical mechanics and kinetic theory applied to topics of engineering thermodynamics. Prerequisite: 389.

434—Fracture Mechanics I (3). Mechanics of flawed structure. Concepts include Griffith theory, Barenblatt's theory, Irwin analysis, energy analysis of cracked bodies, fracture toughness testing, plane strain, plane stress, transition temperature concepts, subcritical flaw growth. Prerequisites: 224 or instructor's consent.

435—Heat Transfer-Conduction (3). Distribution of temperature and temperature history within solids by the four essential methods of evaluation of these temperature fields. Prerequisite: 299.

436—Heat Transfer-Convection (3). Principles of heat transfer by convection, review of boundary layer theory, laminar and turbulent heat transfer, temperature-dependent fluid properties, high velocity heat transfer and an introduction to mass transfer. Prerequisites: 299 & 430.

437—Heat Transfer-Radiation (3). Advanced study of engineering radiation heat transfer. Concepts of electromagnetic theory. Development of thermal radiation laws from thermodynamic laws. Analysis of grey and non-grey systems with intervening gases. Study of recent literature. Prerequisites: 299, 304.

438—Introduction to Turbulence (3). An introduction to the physical phenomena of turbulence, supported by mathematical and statistical descriptions. Especially appropriate for engineers involved in research of momentum, heat, and mass transport. Prerequisites: 341.

439—Introduction to Two Phase Flow (3). An introduction to the analysis of the mechanics and transport processes in two phase flows. Prerequisites: 251 and Civil Engineering 251 or equivalent.

441—Physical Gas Dynamics (3). Study of the flow of chemically reacting gases of interest in mechanical and aerospace engineering. Prerequisites: 261 and 299.

444—Fracture and Fatigue Prevention in Engineering Practice (3). Practical design problems. Introduction to retrofit design, maintenance, product improvement and new design from a fatigue and fracture prevention philosophy. Fail safe and safe life designs are presented. Prerequisite: 434.

445—Instrumentation Theory (3). Applied theory of dynamical and energizing systems for analyzing, computing, control devices. Prerequisite: 345.

447—Magnetogasdynamics (3).

450—Superconductivity and Its Applications (3). (same as Electrical Enineering 450 and Nuclear Engineering 450). Phenomenology and theory of superconductivity; practice; metallurgy of superconducting elements, alloys and compounds. Applications, present and prospective.

451—Applications of Computational Fluid Dynamics (3). Applications of DFD, including grid generation, solving the governing equations, and plotting and evaluating the results, to a wide range of basic and complex flow problems. The solutions are obtained and the results plotted using commerical or government CFD codes. Prerequisites: MAE 342 or instructor's consent.

457—Computer Integrated Manufacturing (3). Modeling and simulation of manufacturing processes and advanced computer applications in manufacturing systems and machining processes, NC-programming. Prerequisites: 257 and 280.

459—Dynamics of Structures (3). (same as Civil Engineering 459).

460—Combustion (3). Numerical modeling of combustion systems and advanced diagnostic techniques. Prerequisites: 341, 391.

485—Advanced Vibration Analysis (3). Advanced topics in vibration theory and its application to Mechanical Systems. Topics include vibration analysis of multi-degree of freedom, distributed and nonlinear systems, random vibration analysis, and vibration control. Prerequisites: MAE/CE 385 or instructor's consent.

486—Finite Element Methods (3). (same as Civil Engineering 486). The concepts and fundamentals of the finite element method with applications to problems in solid and fluid mechanics. Prerequisites: 386 or Civil Engineering 375.

489— (3). Advanced topics from classical thermodynamics. Prerequisite: 389.

490—Research (1-99.9). Independent investigation in field of mechanical and aerospace engineering to be presented as a thesis. Graded on a S/U basis only.

495—Advanced Vehicle Dynamics (3). Applications of advanced dynamics, sensitivity analysis, and stability methods to analysis of complex vehicle dynamic systems. Modeling of pneumatic tire behavior, development and experimental validation of advanced vehicle computer simulations.

499—Microscale Heat Transfer (3). Review of existing models. Concept of thermal lagging and the second-law admissibility. Applications to low temperatures, thermal processing of thin-film devices; amorphous materials; advanced composites. Prerequisite: MAE 299 or instructor's consent.

Medieval and Renaissance Studies (Minor)

107 Tate Hall (573) 882-4971

FACULTY

Martin Camargo, chair, professor of English, PhD, University of Illinois.

Robert M. Bender, professor of English, PhD, University of Michigan.

Thomas D. Cooke, professor of English, PhD, University of Pittsburgh.

John Miles Foley, professor of English and classical studies, PhD, University of Massachusetts.

Norman Land, professor of art history and archaeology, PhD, University of Virginia.

Mary Jo Muratore, professor of French, PhD, University of California-Davis.

Charles G. Nauert, professor emeritus of history, PhD, University of Illinois.

Osmund Overby, professor emeritus of art history and archaeology, PhD, Yale University.

Ellie Ragland, professor of English and French, PhD, University of Michigan.

Jill Raitt, professor of religious studies, PhD, University of Chicago.

John R. Roberts, professor of English, PhD, University of Illinois.

Charles F. Saylor, professor of classical studies, PhD, University of California-Berkeley.

A. Mark Smith, professor of history, PhD, University of Wisconsin.

Margaret P. Sommers, professor of French, PhD, Stanford University.

Henry Sullivan, professor of Spanish, PhD, Harvard University.

Russell Zguta, professor of history, PhD, The Pennsylvania State University.

Ben L. Honeycutt, associate professor of French, PhD, The Ohio State University.

Daniel Hooley, associate professor of classical studies, PhD, University of Minnesota.

Marcus Rautman, associate professor of art history and archaeology, PhD, Indiana University.

Alexander von Schoenborn, associate professor of philosophy, PhD, Tulane University.

Lois L. Huneycutt, assistant professor of history, PhD, University of California-Santa Barbara.

William Kerwin, assistant professor of English, PhD, University of North Carolina.

Charles D. Presberg, assistant professor of Spanish, PhD, Harvard University.

David T. Read, assistant professor of English, PhD, University of Chicago.

Anne Stanton, assistant professor of art history and archaeology, PhD, University of Texas.

John Zemke, assistant professor of Spanish, PhD, University of California-Davis.

The staff of the Medieval and Renaissance studies program is composed of faculty members from the departments of art history and archaeology, classical studies, English, German and Russian studies, history, music, philosophy, religious studies and romance languages. A doctoral candidate in one of these departments offering a PhD may elect a minor concentration in interdisciplinary medieval or renaissance studies by taking at least three appropriate courses outside the department, and all appropriate ones within it. Thus, one earns, for example, a PhD in art history and archaeology with specialization in medieval studies, or a PhD in history with specialization in renaissance studies. Under certain circumstances, a minor in medieval or renaissance studies also may be arranged for MA programs.

Ellis Library has large collections in the medieval and renaissance fields and course offerings in the two fields are extensive.

Information on fellowships may be obtained

by writing to the director of graduate studies in the department of major interest.

REQUIREMENTS: A student must be accepted for advisement by the major department. Then, in consultation with the major adviser, who must be a specialist in the medieval or renaissance period, an interdisciplinary curriculum for the minor is prepared and submitted to the area committee for approval. Because the program places considerable emphasis on foreign languages, all doctoral candidates must study at least two languages, and sometimes more are required.

COURSES

405—Seminar in Medieval and Renaissance Studies (3). Interdisciplinary course. Advanced study/research in selected topics, European civilization during medieval, renaissance, reformation periods. May be repeated twice. Prerequisite: graduate status in departments having courses in medieval or renaissance area (humanities/social sciences).

Molecular Microbiology and Immunology

School of Medicine
M616 Medical Sciences Building (573) 882-8152

FACULTY

Arnold L. Smith, chair, professor, MD, University of Missouri-Columbia. Pathogenesis of *Haemophilus influenzae* infections; infections in cystic fibrosis.

Karen L. Bennett, director of graduate studies, associate professor, PhD, Roswell Park Memorial Institute, State University of New York-Buffalo. Germ differentiation in *C. elegans.*

John F. Cannon, director of graduate admissions, associate professor, PhD, University of Wisconsin-Madison. Role of RAS in cell adaptation.

James T. Barrett, professor emeritus, PhD, University of Iowa.

Helen Braley-Mullen, professor, PhD, Purdue University (Medicine). Autoimmune diseases, particularly thyroiditus.

Abraham Eisenstark, professor emeritus, PhD, University of Illinois.

Frank B. Engley Jr., professor emeritus, PhD, University of Pennsylvania.

Richard A. Finkelstein, professor, PhD, University of Texas. Pathogenesis and immunity to cholera.

Ramareddy V. Guntaka, professor, PhD, Kansas State University. Mechanisms of control of Rous sarcoma virus transcription.

Mark A. McIntosh, professor, PhD, University of Texas. Regulation mechanisms of iron uptake systems in bacteria.

Michael L. Misfeldt, professor, PhD, University of Iowa. Mechanisms of mucosal immunity.

Charlotte D. Parker, professor emerita, PhD, University of California-Los Angeles.

David J. Pintel, professor, PhD, University of Illinois-Chicago. Regulation of parvovirus.

Kim S. Wise, professor, PhD, University of Southern California. Pathogenic role of mycoplasmas.

David R. Lee, associate professor, PhD, University of Virginia. Mechanisms of antigen presentation.

Gregory A. McDonald, associate professor, PhD, University of Virginia. Pathogenesis of rickettsial infections.

Hammond G. Riggs Jr., associate professor emeritus, PhD, University of Texas Southwestern Medical School.

W. Andrew Simpson Jr., associate professor, PhD, University of Tennessee-Memphis (VA Hospital/ Medicine).

DEGREES: MS and PhD in microbiology (medicine)

COOPERATIVE DEGREES: MD and PhD in microbiology (medicine)

INTERDISCIPLINARY AREA PROGRAM: PhD in genetics area program

The Department of Molecular Microbiology and Immunology offers individualized graduate programs designed to prepare students for advanced professional careers in microbiology. Emphasis is placed on the PhD program designed to develop outstanding students for productive supervisory roles in universities and colleges, industry, government and research institutes. The PhD degree is offered only to students who demonstrate a high level of specialized knowledge and clear evidence of research potential. Under exceptional circumstances, the department will award the master of science (MS) degree. The MS program requires about two years of advanced study culminating in a research thesis under the supervision of the student's adviser and is not a prerequisite to the PhD.

Most students in the doctoral program are awarded teaching or research assistantships. Under the guidance of faculty members, teaching assistants are given practical experience in planning, organizing, teaching and laboratory preparation in microbiology. Research assistants work with faculty members to obtain practical experience in planning research proposals, collecting research data and writing research reports. All students in the graduate program are required to participate as teaching assistants during their graduate studies.

The department is equipped to support a wide range of research activities at the cutting edge of our diverse science. Faculty research activities focus on key problems in pathogenic microbiology, immunology, molecular biology, genetics and virology.

ADMISSION REQUIREMENTS: Enrollment is limited to those students who show evidence of potential for research. Minimum requirements for acceptance to the graduate program include a baccalaureate degree from an accredited college or university, with courses in the following: biology (botany or zoology); advanced courses in biochemistry and/or molecular biology are highly desirable; chemistry (quantitative and organic); physics (one year); and mathematics (college algebra, analytic geometry or trigonometry). Applicants are required to provide their scores on the GRE general test and letters of recommendation from individuals competent to comment on the applicant's potential for graduate work.

MASTER'S DEGREE: The minimum course requirements are 39 hours of graduate study, 16 of which must be in courses at the 400 level. Additional requirements are individually designed based on undergraduate experience.

To fulfill the degree requirements, a student must complete original research in preparation of a thesis and pass an oral examination in defense of the thesis and covering course work.

DOCTORAL DEGREE: To be accepted for candidacy into the PhD program in microbiology, all applicants must perform satisfactorily in a core curriculum that includes advanced-level courses in the subdisciplines of immunology, molecular biology and microbial pathogenicity. Under the guidance of a doctoral program committee, a course of study is individually designed to fit each student's academic background, experience and objectives. Interdisciplinary courses in biochemistry, molecular and cellular biology and genetics provide breadth and balance in the program and enhance the student's research abilities. In addition, the PhD program consists of the following:

- Practical experience in teaching
- Successful completion of a comprehensive examination that tests the student's ability to develop an original scientific hypothesis and devise a feasible research plan that will test the hypothesis
- A demonstration of research and writing ability by completing a scholarly dissertation on an approved research problem that results in the contribution of significant new knowledge. The final examination primarily covers this dissertation research.

COURSES

205—Introduction to Medical Microbiology (4). Principles of infection, immunity and control of infectious disease agents; primarily for students in School of Nursing and School of Health Related Professions. f,w.

301—Microbiology-Bacteriology (3). Microbial diversity, physiology, genetics and membrane structure and function. Microbial mechanisms of pathogenesis and current strategies for diagnostics, treatment and prevention. Prerequisites: Biological Sciences 212 and Biochemistry 270 and instructor's consent.

303—Medical Virology (3). Classification of viruses, life cycles, genome organization and expression, host virus interactions, oncogenes and cellular transformation, strategies for anti viral therapy, recombinant vaccines and viruses as vectors for gene therapy. Prerequisite: Microbiology-Bacteriology 301 or equivalent or instructor's consent.

304—Immunology (3). Covers immunocytology and immunochemistry of antigens, immunoglobulins, and the complement system, serologic reactions, immunoglobulin and T cell mediated allergy, tumor and transplantation immunology and autoimmune disease, also laboratory demonstrations. Prerequisites: Organic Chemistry and Biochemistry recommended. f.

400—Problems (1-99). Students assigned individual problems in microbiology for library or lab investigation. Prerequisite: strong background in Microbiology. f,w,s.

401—Topics (1-99). Current topics, highly specialized topics taught infrequently, or courses taught by visiting professors. Prerequisite: graduate standing and instructor's consent.

403—Advanced Medical Microbiology (3). Similar to 301 but treats medical microbiology and immunology in a more advanced manner. Methods of preparation and instruction stressed. Prerequisite: 301 or equivalent. f,w.

404—Pathogenic Mechanisms (3). Microbial toxins, virulence factors, and host interactions. Prerequisites: Microbi-

ology 301, medical microbiology, graduate standing and instructor's consent. f.

407—Advanced Immunology (3). Lectures and discussions emphasizing theoretical aspects of immunology and detailed considerations of the more involved areas of this science. Prerequisites: 304 or instructor's consent. w, even years.

410—Seminar (1). Presentation and critical discussion of student and staff research, current literature, and guest lectures on subjects in various areas of microbiology. Prerequisite: graduate standing and instructor's consent.

411—Responsible Conduct of Research (1). Ethical, legal and sociological ramifications of research including data management, authorship, human and animal use, conflict of interest and misconduct. Round table discussions and interactive forums. Grading based on participation in discussions and assignments. Graded on S/U basis only. w, even yrs.

432—Molecular Biology II (3). Detailed experimental analysis of eukaryotic cellular and molecular biology relevant to cellular and viral gene expression, post-transcriptional and post-translational modifications and genome replication. Models for developmental genetic analysis and genetic determinants controlling developmental processes utilizing the current literature will be examined. Prerequisite: Molecular Biology I/Biochemical Genetics 430, graduate standing, and instructor's consent. w. (Same as Biochemistry 432.)

490—Research (1-99.9). Original investigations in various areas of microbiology related to bacteria, fungi, rickettsia, viruses, and animal parasites, or immunology relating to antigens and antibodies of infectious and noninfectious nature designed for graduate thesis research. Graded on a S/U basis only. f,w,s.

Museum Studies

109 Pickard Hall (573) 882-6711

DEGREE: interdisciplinary graduate minor in museum studies

As the catalog goes to press the structure of this program is being reevaluated.

This minor, offered by the Department of Art History and Archaeology, provides students with a systematic introduction to the history, philosophy and role of museums. The program blends academic theory with practical experience to provide students with an opportunity to build a foundation applicable for work in either university or public museums.

CURRICULUM: The program comprises six courses designed to introduce students to the history and role of museums in society; to the philosophical, legal and administrative issues that face the modern museum; and to the exhibition and preservation skills required of a museum curator. The emphasis of the program is on museum management, curatorial responsibilities (collection management and exhibition), and educational interpretation. Internships and field trips to local museums provide additional insight into the world of museum professionals. Individual courses are listed under **Art History and Archaeology**.

Successful completion of the program is accomplished through 12 credit hours of required course work, including AHA 470, 471 and 476 (a three-credit hour internship), and is recognized when students successfully complete a graduate degree program in their academic field of study. An individual's course of study for the minor will be arranged with the program director.

The minimum period required to complete the minor is four semesters, or three semesters and one summer.

ADMISSION: All students who undertake the museum studies minor are normally already enrolled as graduate students in degree-granting academic departments. Students should apply for admission at the beginning of the fall semester. Application is made to the director of graduate studies of the department of Art History and Archaeology, 109 Pickard Hall, Columbia, MO 65211.

Music

College of Arts and Science
140 Fine Arts Center (573) 882-2604

FACULTY

Melvin Platt, chair, professor, PhD, University of Michigan. Music education/administration.

Alexander Pickard, assistant chair, associate professor, DMA, Eastman School of Music, University of Rochester. Trumpet/administration.

Wendy Sims, director of graduate studies in music education, professor, PhD, Florida State University. Music education/elementary-general.

Dan Willett, director of graduate studies in music, associate professor, MM, Michigan State University. Oboe.

Nathaniel Brickens, professor, DMA, University of Texas-Austin. Trombone/euphonium.

John Cheetham, professor, DMA, University of Washington. Composition/theory.

Raymond Herbert, professor, MM, Eastman School of Music, University of Rochester. Piano.

W. Thomas McKenney, professor, PhD, Eastman School of Music, University of Rochester.

David Rayl, professor, DMA, University of Iowa. Choirs/conducting.

Betty Scott, professor, PhD, Florida State University. Trumpet/music appreciation.

Eva Szekely, professor, MS, Juilliard School of Music. Violin.

Janice Wenger, professor, DMA, University of Missouri-Kansas City. Piano/accompanying.

Martin Bergee, associate professor, PhD, University of Kansas. Music education.

Michael Budds, associate professor, PhD, University of Iowa. Music history.

Edward Dolbashian, associate professor, MMA, Yale University. Orchestra/conducting.

Paul Garritson, associate professor, MM, Yale University. Clarinet.

Steven Geibel, associate professor, MM, University of Missouri-Columbia. Flute.

Ann Harrell, associate professor, MM, University of Texas-Austin. Voice.

Dale J. Lonis, associate professor, EdD, University of Illinois. Bands/conducting.

John McLeod, associate professor, MM, Manhattan School of Music. Violin.

Darry Dolezal, assistant professor, MM, Peabody Institute. Cello.

Frederic Hemke, assistant professor, MM, Northwestern University. Jazz performance.

John Koegel, assistant professor, PhD, The Claremont Graduate School. Music history, world music.

Neil Minturn, assistant professor, PhD, Yale University. Theory.

Leslie Perna, assistant professor, MM, Boston University. Viola.

Marcia Spence, assistant professor, DMA, University of North Texas. French horn/aural skills.

Jo Ella Todd, assistant professor, MM, New England Conservatory. Voice.

Eric Gargrave, adjunct instructor, MM, Indiana University. Clarinet, saxophone, theory, Community Music School.

Connie Herbert, adjunct assistant professor, DMA, University of Missouri-Kansas City. Piano pedagogy.

Sue Stubbs, adjunct professor, MM, University of Missouri-Columbia. Double bass.

Jeff Hoard, adjunct assistant professor, Eastman School of Music, University of Rochester. Tuba.

Julia Hillbrick, visiting instructor, MM, University of Calgary. Percussion.

DEGREES: MA and MM in music; and MA, M Ed, EdSp, EdD and PhD in curriculum and instruction with an emphasis area in music education

The Department of Music offers graduate work leading to a Master of Music (MM) and a Master of Arts (MA) degree in music. Degrees with a major in music education are offered by the Department of Curriculum and Instruction in the College of Education, in conjunction with the Department of Music. These degrees include the Master of Arts (MA), Master of Education (M Ed), Educational Specialist (EdSp), Doctor of Education (EdD) and Doctor of Philosophy (PhD) in education, with an emphasis area in music education.

At MU a student of music has an unusual opportunity to hear concerts or to participate in a variety of performing organizations. Many recitals are given by students, faculty and visiting artists. Among the student ensembles that give several concerts during the year are the University Philharmonic, Symphonic Wind Ensemble and other concert bands, instrumental jazz ensembles, University Singers and other choral ensembles, opera workshop and chamber music groups. Faculty ensembles that present recitals regularly include the Esterhazy Quartet and the Missouri Quintet.

The music section of the Fine Arts Building contains a recital hall, classrooms, studios and practice facilities, all air-conditioned and suitably equipped. The music holdings in Ellis Library, both printed and recorded materials, constitute a substantial research and reference collection. The department maintains an electronic piano and MIDI laboratory, an electronic music studio, access to a listening laboratory for history and theory courses, and a computer-assisted instruction laboratory.

EXAMINATIONS AND OTHER GENERAL REQUIREMENTS: All entering graduate students are required to take advisory examinations in music history and theory during registration for the fall, winter and summer sessions. Two-hour exams will be given in music history and theory. In addition, performance majors are auditioned by the faculty in their applied area. The results of this entire procedure are used as a basis for advisement and development of each student's graduate program.

Students in all master's degree programs are

expected to participate in a major ensemble each semester of full-time enrollment except summer sessions. After completion of course work for the degree, all candidates for the MM or MA degree must successfully complete a final written comprehensive examination.

The Music Department Student Handbook contains detailed course requirements for the various programs. Prospective students may write to the department to request information about the prerequisites and graduation requirements for specific academic areas, and assistantships or other financial aids.

THE MASTER OF MUSIC DEGREE consists of studies in a major field of concentration along with a required core of studies in performance, music history, theory and research skills. The principal function of this graduate program is to provide students with opportunities for continued development of individual musical talents and scholarly competence. This degree is designed to prepare the graduate for a career in performance, college teaching or continued graduate studies toward a doctoral degree.

In the MM program, the student may concentrate in applied music, theory, composition or conducting. The applied areas for performance concentrations are piano, piano accompanying and pedagogy, strings, voice, woodwind, brass and percussion instruments. A candidate must have a bachelor's degree in music (or demonstrated equivalent) in the same area as that to be pursued at the graduate level. If a senior recital was not presented for the bachelor's degree, then such a program must be given by the student before the graduate recital. Prospective students should write to the department for specific prerequisites to each concentration within the MM degree.

Performance. To satisfy the requirements for the MM degree concentrating in one of the applied areas, a student must complete a minimum of 32-33 hours of graduate work, with a minimum of 16 hours of courses at the 400 level. Admission to 400-level applied courses is determined by audition. In all areas, six hours of music history, five hours of music theory and Introduction to Graduate Studies (three hours) are required. Graduate-level courses in the area, repertory and electives complete the course requirements.

All performance majors in the MM degree program present a graduate recital. Piano majors also present a memorized performance of a concerto with orchestra or second piano. Accompanying and pedagogy majors are required to present three recitals. One recital is to be a combined solo and chamber music recital and the other two are to be given as accompanist to a vocalist and an instrumentalist, respectively. All graduate recitals must be approved by a faculty hearing before the public performance.

Theory or Composition. The prerequisites for the master of music degree in either theory or composition include a bachelor's degree in music, evidence of study and satisfactory completion of 18 hours in basic theory courses (including two hours of form and analysis), one semester of 16th- or 18th-century counterpoint and one semester of orchestration, an additional two-hour theory elective for theory majors, eight hours of composition for composition majors, four hours of music history, satisfactory keyboard, sight-singing and part-writing skills, 16 hours or the equivalent of undergraduate applied music, and a review of recent creative works for composition majors.

All candidates for the MM degree in theory or composition must file a formal application with the theory staff for admission to the program. The program of study consists of a minimum of 34 hours, including 20 hours of advanced courses in theory, six hours of music history, five hours of applied music, and Introduction to Graduate Studies (three hours). Theory majors must satisfactorily complete a thesis on an approved topic. Composition majors must complete a substantial composition project. Both theory and composition majors are given a final oral examination based on their projects.

Conducting. The master of music degree is available in choral, band and orchestral conducting. Entrance to the conducting program requires a bachelor's degree in music, and preferably conducting experience in choral, band or orchestral ensembles. The curriculum for each conducting major includes Introduction to Graduate Studies in Music (three hours), six hours in music history, five hours in music theory, two conducting recitals, study in choral and instrumental conducting, repertory, techniques, ensemble performance and applied study.

THE MASTER OF ARTS DEGREE is offered with a major in music history. A minimum of 33 credit hours is required, which consists of studies in the major area, other supportive music courses, research skills and applied studies or electives in non-music areas. Objectives for this graduate program include opportunities for continued development of individual musical talents, scholarly competencies and the enhancement of interests in areas other than music. This liberal graduate education is designed to prepare a student to pursue a career in college teaching or continue graduate studies toward a doctoral degree.

Prerequisites for the MA in music history are approval of the music history faculty, two years of piano, with sufficient proficiency in technique and sight reading to be of use as a tool for investigation, 16 hours of harmony, ear-training and sight singing, one semester of counterpoint, form and analysis, eight hours of music history and reading knowledge of at least one foreign language.

The MA in music history includes two to eight hours in applied music, at least eight hours of music history and four hours of thesis research, three hours of Introduction to Graduate Studies, one non-music course, and ensemble participation. Music history courses used to satisfy prerequisites for admission may not be retaken for graduate credit.

COURSES

MUSIC—GENERAL

300—Problems (1-99.9). Independent investigation leading to a paper or project. May be repeated for credit. Prerequisite: instructor's consent. Sections are: Music Theory, Music Composition, Music History, Music Performance/Pedagogy.

301—Topics (1-99.9). Organized study of selected topics in music. Subjects and credit variable. May be repeated for additional credit with departmental consent. Prerequisites: junior standing in Music and instructor's consent.

400—Problems (1-99.9). Independent investigation leading to a paper or project. May be repeated for credit. Prerequisite: instructor's consent. Sections are: Music Theory, Music Composition, Music History, Music Performance/Pedagogy.

401—Topics (1-99.9). Organized study of selected topics in music. Subjects and credit variable. May be repeated with departmental consent. Prerequisites: graduate standing and departmental consent.

413—Introduction to Graduate Study (2). Introduction to library procedures, basic sources of information in music and techniques for research.

414—Introduction to Graduate Studies in Music II (1). The application of basic music bibliography, research techniques, and conventions of music scholarship. Prerequisite: Music 413 or instructor's consent.

429—Travel Seminar (1-4). Selected topics for directed study in music undertaken in context of the tour. Emphasis on subjects with cross-disciplinary implications. Participant bears cost of course. Prerequisite: instructor's consent.

490—Research (1-99.9). Thesis course. May be repeated for additional credit. Graded on S/U basis only. Sections are: Music Theory, Music Composition, Music History. Performance/Pedagogy

499—Seminar (1-3). Sections are: Music Theory, Music Composition, Music History, Performance/Pedagogy.

MUSIC THEORY

215—Composition III (2). Further development of creative writing in traditional forms. Prerequisite: 116.

216—Composition IV (2). Continuation of 215. Prerequisite: 215.

280—Aural Training and Sight Singing III (2). Continuation of 181. Further development of aural and sight singing skills with an emphasis on chromatic harmony and decorative pitches. Introduction of structural perception. Prerequisites: 181 & 290 or 290 concurrently.

281—Aural Training and Sight Singing IV (2). Continuation of 280. Prerequisites: 280 and 291 or 291 concurrently.

290—Syntax, Structure and Style of Music III (2). Chromatic harmony, variation techniques and contrapuntal genres. Study of traditional forms in instrumental, vocal and choral compositions. Applications through original composition projects. Prerequisite: 191

291—Syntax, Structure and Style of Music IV (2). Continued study of chromatic harmony and compositions in larger forms. Application through original composition projects. Prerequisite: 290.

303—Eighteenth-Century Counterpoint (3). Study of contrapuntal procedures and representative works of the eighteenth century. Emphasis on compositions and style of Johann Sebastian Bach. Original composition projects: canon, invention, and fugue. Prerequisite: 291 or instructor's consent

305—Sixteenth-Century Counterpoint (3). Analysis of contrapuntal procedures and representative compositions of 16th century. Emphasis on styles of Palestrina, Lassus and Victoria. Stylistic writing in two, three or more voices. Prerequisite: 291.

307—Orchestration (2). Study of orchestral instruments and the process of scoring for various orchestral combinations. Prerequisite: 291.

309—Band Arranging (2). Transcription, scoring of solo and ensemble literature for band instrument combinations of varying sizes up to and including concert band. Prerequisite: 291.

310—Choral Arranging (2). Transcription and arrangement of music suitable for performance by various vocal ensembles. Prerequisite: 291.

313—20th Century Compostion Techniques (2). The study and application of analytical procedures to 20th century music literature. Special readings; individual projects. Prerequisite: graduate standing or instructor's consent.

314—Computer Technology and Music (2). The introduction of music software for educational and professional use. Music notation software will be learned. Sequencing software will be studied in depth. Hands-on experience with Macintosh computers, multiptimbral synthesizers and various CD-ROMS. Prerequisite: 313 or instructor's consent.
315—Composition V (2). Writing of works in larger forms for a solo instrument or chamber ensemble. Prerequisite: 216.
316—Composition VI (2). Continuation of 315. May be repeated for additional credit. Prerequisite: 315.
331—Schenkerian Analysis (3). Techniques of musical analysis developed by Heinrich Schenker. Prerequisite: 291.
333—Acoustics of Music (2). The study of tuning systems and the properties, production and reception of musical sound. Prerequisites: 3 or instructor's consent.
344—Analysis of Music (2). An analytical study of rhythmic, melodic, harmonic and structural aspects of 18th-, 19th- and 20th-century music. Prerequisite: 291 or equivalent.
345—Introduction to Electronic Music (2). Techniques used in the creation of music with tape recorders, voltage-controlled synthesizers and electronics. Prerequisites: 313 or instructor's consent.
347—Introduction to Digital Synthesis (2). Introduction to the techniques of digital synthesis, including the study of programming, and Musical Instrument Digital Interfacing.
403—Analysis of Musical Styles (2). Analytical study of specific rhythmic, melodic, harmonic, and structural factors which constitute the stylistic practices of a specific period or composer. Prerequisite: 344 or equivalent. departmental consent for repetition.
407—Advanced Orchestration I (2). Transcription for full orchestra of large works from different style periods. Scoring of original works for orchestra. Seminar, private lessons. Prerequisite: 308.
408—Advanced Orchestration II (2). Continuation of 407. Survey of original works for orchestra. Prerequisite 407.
411—Comparative Approaches to Music Theory I (2). Techniques and materials for teaching basic music theory courses for high schools and colleges. Prerequisite: 291.
412—Comparative Approaches to Music Theory II (2). Techniques and materials for advanced college courses in music theory. Prerequisite: 411.
415—Composition VII (2). Intensive work in larger forms. Seminar, private lessons. Prerequisites: 316 or instructor's consent. Departmental consent for repetition.
444—Contemporary Analytical Techniques (2). Study and application of various analytical systems for 20th- century compositions. Analysis of music employing contemporary theories.

MUSIC HISTORY AND LITERATURE

265—American Musicals (3). (same as Theatre 265). Historical survey of the development of the 20th-Century American Musical in Theatre and Film.
297—Honors in Music History I (3). Special readings, directed research for graduation with Honors in music history. Prerequisites: 217 and 218.
298—Honors in Music History II (3). Continuation of 297 leading to Honors thesis in music history. Prerequisite: 297.
317—Graduate Review of Music History I (2). Survey of the history of Western music from ca. 600 A.D. to ca. 1750. Special readings; individual projects.
318—Graduate Review of Music History II (2). Survey of the history of Western music from ca. 1750 to the present. Special readings; individual projects.
371—Historical Studies in Art Song (3). Historical survey of works for solo voice and instruments. Prerequisite: Music 218 or graduate status.
372—Historical Studies in Choral Music (3). Historical survey of works featuring choral ensembles. Prerequisite: Music 218 or graduate status.
373—Historical Studies in Opera (3). Historical survey of opera. Prerequisite: Music 218 or graduate status.
374—Historical Studies in Large Ensemble Music (3). Historical survey of works for large instrumental ensembles. Prerequisite: Music 218 or graduate status.
375—Historical Studies in Chamber Music (3). Historical survey of works for small ensembles, instrumental and vocal. Prerequisite: Music 218 or graduate status.
376—Historical Studies in Keyboard Music (3). Historical survey of works for solo keyboard instruments. Prerequisite: Music 218 or graduate status.
377—Historical Studies in Jazz and Popular Music (3). Historical survey of works from the realm of American jazz and popular music. Prerequisite: Music 218 or graduate status.
423—Studies in Music History I (2). Selected themes for detailed investigation of the Medieval, Renaissance or Baroque periods. Special readings; individual projects. May be repeated once for additional credit. Prerequisite: instructor's consent.
424—Studies in Music History II (2). Selected themes for detailed investigation of the Classic, Romantic or Modern periods. Special readings, individual projects. May be repeated once for additional credit. Prerequisite: instructor's consent.
426—History of Performance Practices (2). Performance practices; emphasizes Renaissance and Baroque periods. Prerequisite: instructor's consent.
435—Music of the Middle Ages and the Renaissance (3). Systematic study of European musical practice before 1600. Prerequisite: graduate status or instructor's consent.
436—Music in the Baroque Era (3). Systematic study of European musical practice from approximately 1600 to 1750. Prerequisite: graduate status or instructor's consent.
437—Music of the Classic Era (3). Systematic study of European musical practice from approximately 1750 to 1800. Prerequisite: graduate status or instructor's consent.
438—Music of the Romantic Era (3). Systematic study of European musical practice from approximately 1800 to 1900. Prerequisite: graduate status or instructor's consent.
439—Music of the Modern Era (3). Systematic study of fine-art musical practice from approximately 1900 to the present. Prerequisite: graduate status or instructor's consent.
440—Focal Composers (3). Systematic study of the works of landmark composers: J.S. Bach, Mozart, Beethoven, Verdi/Wagner, Debussy, or Stravinsky, studied in rotation. Prerequisite: graduate status or instructor's consent. Repeatable for up to 6 hours or credit.
441—Advanced Studies in American Music (3). Systematic study of the diverse streams of musical practice in the United States from the colonial time to the present. Prerequisite: graduate status or instructor's consent.
442—Contemporary Issues in Musicology (3). Systematic study of single musiocological problem of contemporary relevance. Prerequisite: graduate status or instructor's consent.

MUSIC—APPLIED MUSIC

254—Studio Instruction for Non-Majors (1-2). Acceptable for upperclass credit for non-majors only. May be repeated for credit. Prerequisite: student has passed a 200 level exam, has completed four semesters of 154 or the equivalent, and instructor's consent.
255—Studio Instruction (1-3). Accepted as upperclass credit only in Music Education and for Graduate credit on M.Ed. degree. May be repeated for credit. Prerequisites: 8 hours and 4 semesters of 155 or equivalent; audition by committee, and instructor's consent.
295—Junior Recital (1). Preparation and presentation of Junior Recital. Appropriate applied music course to be taken concurrently. May be repeated for credit. Each recital must be approved by a committee at least two weeks before the recital.
340—Individual Instruction in Instrumental and Vocal Techniques (1). For music teachers needing instruction in secondary instruments or voice. Maybe repeated for credit.
355—Studio Instruction (1-5). Acceptable as upperclass credit on B.M. degree, graduate credit on M.A., M.Ed., Ed.D., and Ph.D. degrees. May be repeated for credit. Prerequisites: 8 hours and 4 semesters of 155; audition by committee; and instructor's consent.
395—Senior Recital (1). Preparation and presentation of Senior Recital. Appropriate applied music course to be taken concurrently. May be repeated for credit. Each recital must be approved by a committee at least two weeks before the recital.
455—Studio Instruction (1-5). Required for graduate credit as major applied study on M.M. degree. Acceptable for graduate credit on M.A., M.Ed., Ed.D., and Ph.D. degrees. Maybe repeated for credit. Prerequisites: audition by committee and instructor's consent.
495—Graduate Recital (1). Preparation and presentation of Graduate Recital. Appropriate applied music course to be taken concurrently. May be repeated for credit. Each recital must be approved by a committee at least two weeks before the recital.

MUSIC—INSTRUMENTAL AND VOCAL TECHNIQUES

240—Undergraduate Seminar in Vocal Techniques (1). Discusses accepted techniques of singing, practical application to posture, breath support, tone placement, musicianship, diction, interpretation, stage deportment. Recognizing and solving specific vocal problems. May be repeated once for credit. Prerequisite: instructor's consent.
242—Seminar in String Techniques (1). In-depth study of publications, philosophies, repertory, grading, specific problems for the string player. May be repeated once for credit. Prerequisites: 140 & 141, or instructor's consent.
243—Symposium in Instrumental Music (2). Study of procedures, techniques and literature for variable combinations of wind, string, and percussion classes and the administration of instrumental music programs. Prerequisite: junior standing in Music or Music Education or instructor's consent.
244—Jazz Methods and Materials (1). Training and supervised practice in conducting Jazz Ensembles; study of administration, methods, and materials pertinent to teaching Jazz, Rock, and Commercial Music in high school and college. Prerequisites: junior standing or instructor's consent.
245—Jazz Improvisation (1). Melodic and harmonic creation on the basis of rhythmic vitality, making use elementary and advanced forms, chord structures, and chromatic alterations. Modal tunes and basic blues progressions are emphasized in class performance. Prerequisites: 244 or instructor's consent.
246—Marching Band Techniques (2). Study of techniques and procedures used in the development of field and street marching. Prerequisite: junior standing in Music or Music Education.
261—Accompanying Skills I (2). Sight reading, harmonization, transposition, score reading, score reduction and figured bass realization. Prerequisites: 181, 191.
262—Accompanying Skills II (2). Continuation of 261 including basic accompanying principles for voice, string, wind and percussion. Prerequisite: 261.
270—Diction in Singing: Italian (1). Study of the correct principles and application of Italian diction in singing the solo vocal, operatic and choral literature; the International phonetic alphabet; spoken language drill, study and recitation of representative literature. Prerequisite: sophomore standing.
271—Diction in Singing: German (1). Study of the correct principles and application of German diction in singing the solo vocal, operatic and choral literature; the International

Phonetic Alphabet spoken language drill, study and recitation of representative literature. Prerequisite: sophomore standing.

272—Diction in Singing: French (1). Study of the correct principles and applciation of French diction in singing the solo vocal, operatic, and choral literature; the International Phonetic Alphabet spoken language drill, study and recitation of representative literature. Prerequisite: sophomore standing

361—Piano Pedagogy Survey I (2). Study of approaches for teaching young beginning and intermediate student; survey of materials and resources. Prerequisite: instructor's consent.

362—Piano Pedagogy Survey II (2). Study of approaches for teaching older, more advanced and class piano students; survey of materials and resources. Prerequisite: instructor's consent.

363—Piano Pedagogy Laboratory (1). Supervised instruction in private and class piano . May be repeated once for additional credit. Prerequisites: 361 and 362.

431—Principles of Singing I (2). Prerequisite: instructor's consent.

432—Principles of Singing II (2). Continuation of 431. Prerequisite: 431.

433—Advanced Choral Conducting (2). Advanced conducting techniques in the interpretation of choral literature; score analysis. May be repeated for additional credit. Prerequisites: 133 or instructor's consent.

434—Advanced Instrumental Conducting (2). Advanced conducting techniques in the interpretation of band and orchestral literature; score analysis. May be repeated for additional credit. Prerequisites: 134 or instructor's consent.

461—Advanced Piano Pedagogy I (3). (same as Curriculum and Instruction T461). Survey of materials and techniques of instruction for teaching the young beginner and the intermediate piano student. Supervised private teaching concurrently. Prerequisites: graduate standing and instructor's consent.

462—Advanced Piano Pedagogy II (3). (same as Curriculum and Instruction T462). Survey of materials and techniques of instruction for teaching class piano, the older beginner and the advanced student. Supervised class piano teaching concurrently. Prerequisites: graduate standing and instructor's consent.

466—Choral Techniques (3). Study of techniques for developing choral singing and musical interpretation. Prerequisites: graduate standing and instructor's consent.

469—Band Techniques (3). To develop individual conducting techniques as well as instrumental ensemble techniques. Emphasis is placed on the learning process to give the student a perspective to improve the techniques of others. Prerequisites: graduate standing and instructor's consent.

MUSIC—INSTRUMENTAL AND VOCAL REPERTORY

240—Undergraduate Seminar in Vocal Techniques (1). Discusses accepted techniques of singing, practical application to posture, breath support, tone placement, musicianship, diction, interpretation, stage deportment. Recognizing and solving specific vocal problems. May be repeated once for credit. Prerequisite: instructor's consent.

242—Seminar in String Techniques (1). In-depth study of publications, philosophies, repertory, grading, specific problems for the string player. May be repeated once for credit. Prerequisites: 140 & 141, or instructor's consent.

243—Symposium in Instrumental Music (2). Study of procedures, techniques and literature for variable combinations of wind, string, and percussion classes and the administration of instrumental music programs. Prerequisite: junior standing in Music or Music Education or instructor's consent.

244—Jazz Methods and Materials (1). Training and supervised practice in conducting Jazz Ensembles; study of administration, methods, and materials pertinent to teaching Jazz, Rock, and Commercial Music in high school and college. Prerequisites: junior standing or instructor's consent.

245—Jazz Improvisation (1). Melodic and harmonic creation on the basis of rhythmic vitality, making use elementary and advanced forms, chord structures, and chromatic alterations. Modal tunes and basic blues progressions are emphasized in class performance. Prerequisites: 244 or instructor's consent.

246—Marching Band Techniques (2). Study of techniques and procedures used in the development of field and street marching. Prerequisite: junior standing in Music or Music Education.

261—Accompanying Skills I (2). Sight reading, harmonization, transposition, score reading, score reduction and figured bass realization. Prerequisites: 181, 191.

262—Accompanying Skills II (2). Continuation of 261 including basic accompanying principles for voice, string, wind and percussion. Prerequisite: 261.

270—Diction in Singing: Italian (1). Study of the correct principles and application of Italian diction in singing the solo vocal, operatic and choral literature; the International phonetic alphabet; spoken language drill, study and recitation of representative literature. Prerequisite: sophomore standing.

271—Diction in Singing: German (1). Study of the correct principles and application of German diction in singing the solo vocal, operatic and choral literature; the International Phonetic Alphabet spoken language drill, study and recitation of representative literature. Prerequisite: sophomore standing.

272—Diction in Singing: French (1). Study of the correct principles and applciation of French diction in singing the solo vocal, operatic, and choral literature; the International Phonetic Alphabet spoken language drill, study and recitation of representative literature. Prerequisite: sophomore standing

361—Piano Pedagogy Survey I (2). Study of approaches for teaching young beginning and intermediate student; survey of materials and resources. Prerequisite: instructor's consent.

362—Piano Pedagogy Survey II (2). Study of approaches for teaching older, more advanced and class piano students; survey of materials and resources. Prerequisite: instructor's consent.

363—Piano Pedagogy Laboratory (1). Supervised instruction in private and class piano . May be repeated once for additional credit. Prerequisites: 361 and 362.

431—Principles of Singing I (2). Prerequisite: instructor's consent.

432—Principles of Singing II (2). Continuation of 431. Prerequisite: 431.

433—Advanced Choral Conducting (2). Advanced conducting techniques in the interpretation of choral literature; score analysis. May be repeated for additional credit. Prerequisites: 133 or instructor's consent.

434—Advanced Instrumental Conducting (2). Advanced conducting techniques in the interpretation of band and orchestral literature; score analysis. May be repeated for additional credit. Prerequisites: 134 or instructor's consent.

461—Advanced Piano Pedagogy I (3). (same as Curriculum and Instruction T461). Survey of materials and techniques of instruction for teaching the young beginner and the intermediate piano student. Supervised private teaching concurrently. Prerequisites: graduate standing and instructor's consent.

462—Advanced Piano Pedagogy II (3). (same as Curriculum and Instruction T462). Survey of materials and techniques of instruction for teaching class piano, the older beginner and the advanced student. Supervised class piano teaching concurrently. Prerequisites: graduate standing and instructor's consent.

466—Choral Techniques (3). Study of techniques for developing choral singing and musical interpretation. Prerequisites: graduate standing and instructor's consent.

469—Band Techniques (3). To develop individual conducting techniques as well as instrumental ensemble techniques. Emphasis is placed on the learning process to give the student a perspective to improve the techniques of others. Prerequisites: graduate standing and instructor's consent.

MUSIC—ENSEMBLE COURSES

266—Musical Theatre Performance (3). (same as Theatre 266). A practical study for the actor of theatrical songs through character analysis, lyric interpretation, and movement. A performance course. Prerequisite: instructor's consent.

330—Collegium Musicum (1). May be repeated for credit. Prerequisites: audition and instructor's consent. Sections are: Historic Instruments, Chamber Choir.

341—Instrumental Ensemble (1). Research, preparation and performance of instrumental compositions. May be repeated for credit. Prerequisites: audition and instructor's consent. Sections and credit hours are: Philharmonic Orchestra, Chamber Orchestra, Symponic Band, Wind Ensemble, Concert Band, Studio Jazz Ensemble, Jazz Lab Band, Marching Band.

342—Choral Ensemble (1). Research, preparation and performance of choral compositions. May be repeated for credit. Prerequisites: graduate standing, audition and instructor's consent. Sections are: University Singers, Chamber Singers, Choral Union, Vocal Jazz Ensemble, Concert Choral, Men's Chorus, Women's Chorus.

346—Advanced Chamber Music (1). Study, preparation and performance of chamber music. May be repeated for credit. Prerequisites: audition and instructor's consent. Sections are: String Ensemble, Woodwind Ensemble, Brass Ensemble, Percussion Ensemble, Jazz Combo.

365—Opera Production (1-2). Study, preparation and performance of selected operatic or musical theatre works in staged or concert versions. Credit arranged; may be repeated for Credit. Prerequisite: graduate standing, audition and instructor's consent.

Natural Resources

School of Natural Resources
College of Agriculture, Food and Natural Resources
103 Anheuser-Busch Natural Resources Building
(573) 882-6446

Albert R. Vogt, director, professor, PhD, University of Missouri-Columbia.

The School of Natural Resources does not offer graduate degrees in natural resources; however, a few general courses are available to graduate students. For degree programs in the school, see listings under **Fisheries and Wildlife**; **Forestry**; **Parks, Recreation and Tourism**; and **Soil and Atmospheric Sciences**.

COURSES

NATURAL RESOURCES-GENERAL

201—Topics in Natural Resources (1-99). Organized study of selected topics. Subjects and credit may vary from semester to semester. f,w,s.

211—Natural Resource Biometrics (3). Sampling methods and analysis as applied to a variety of natural resources, including fisheries, range, recreation, forest, water and wildlife. Prerequisites: a course in Statistics or instructor's consent. f.

300—Problems (1-99).

315—Natural Resources Management and Water Quality (3). Problems arising from non-point sources associated with forest management and mining. Management techniques for controlling erosion, nutrient loss. Examines methodologies for predicting management impacts. Prerequisites: Agronomy 100; Introductory Inorganic Chemistry or instructor's consent. w.

353—Natural Resource Policy/Administration (3). Principles of policy formation and analysis; relationship of organizational goals to structure, planning and budgeting. Historical background of present natural resource policies; examines current policy issues. Prerequisites: senior standing or instructor's consent. w.

380—Resource Practicum (3). Multidisciplinary planning of a natural resource management program. School of Natural Resources majors only. Prerequisite: senior standing or instructor's permission.

Nuclear Engineering

College of Engineering
E2433 Engineering Building East (573) 882-3550

FACULTY

Tushar Ghosh, director of graduate studies, associate professor, PhD, Oklahoma State University.

Robert M. Brugger, professor emeritus, PhD, Rice University.

Robert L. Carter, professor emeritus, PhD, Duke University.

A.H. Emmons, professor emeritus, PhD, University of Michigan.

W.R. Kimel, dean and professor emeritus, PhD, University of Wisconsin.

Sudarshan K. Loyalka, Curators' Professor, director of Particulate Systems Research Center, PhD, Stanford University.

William H. Miller, James C. Dowell Research Professor, director of the Energy Systems and Resources Program, PhD, University of Missouri-Columbia.

Mark A. Prelas, H.O. Croft Professor, PhD, University of Illinois at Urbana-Champaign.

Wynn A. Volkert, professor, director of radiation sciences division, Department of Radiology, PhD, University of Missouri-Columbia.

Susan M. Langhorst, assistant professor, campus radiation officer, PhD, University of Missouri-Columbia.

Robert V. Tompson, associate professor, PhD, University of Missouri-Columbia.

ADJUNCT FACULTY

Evan J. Boote, assistant professor of radiology, PhD, University of Wisconsin.

Julie E. Dawson, medical physics director at St. Louis University Hospital, PhD, University of Missouri-Columbia.

Gary Ehrhardt, senior research scientist, Research Reactor Center, PhD, Washington University.

Michael Glascock, senior research scientist, Research Reactor Center, PhD, University of Iowa.

Keith Hickey, medical physics director at Regional Radiation Therapy Center, Columbia, Mo., PhD, University of Missouri-Columbia.

Gary Hughes, supervisor of nuclear safety and research at Callaway Power Plant, Union Electric Co., PhD, University of Missouri-Columbia.

Kiratadas Kutikkad, research scientist, Research Reactor Center, PhD, University of Florida.

Jimmy C. Lattimer, associate professor of veterinary medicine, MS, Colorado State University.

Stephen B. Pickup, assistant professor of radiology, PhD, Drexel University.

DEGREES: MS and PhD in nuclear engineering

Area research topics include nuclear materials management, aerosol mechanics, reactor safety analysis, nuclear energy conversion, reactor physics, reactor design, nondestructive testing and measurement, radiative heat transfer, neutron spectrometry, neutron and gamma ray transport, neutron activation analysis, nuclear waste management, nuclear plasma research, health physics, magnetic resonance imaging, radiation therapy, and alternative and renewable energy concepts.

Area research is conducted in several special facilities and laboratories. The Research Reactor Center, a 10-megawatt facility, has the highest power and the highest steady-state neutron flux of any U.S. university reactor. Surrounding the reactor is a 26,000-square-foot laboratory facility for nuclear research.

Recent research has been developed in wide band-gap material production and utilization. This work includes the development of electronic circuits from diamond films and other wide band-gap electronic materials, and the use of diamonds to modify the mechanical, optical, electrical and chemical properties of materials.

Other facilities include the Particulate Systems Research Center, a Cobalt-60 irradiator, a plasma fusion laboratory, nuclear instrumentation laboratory, a radioactive experiment laboratory and the needed digital computers, printers, etc., in labs and student offices.

Financial assistance includes federal (Department of Energy), industrial (primarily electrical utility and Institute for Nuclear Power Operations) and MU fellowships, teaching and research assistantships, and sponsored research assistantships. MU is a participating university in the Department of Energy Fellowships in Nuclear Engineering, Health Physics, Traineeships in Health Physics, Waste Management and Environmental Sciences. Students on probation and international students with no prior educational record in the United States are usually not eligible for financial assistance during the first semester of their programs. However, those who perform satisfactorily during their first semester are then eligible for consideration for research assistantship appointments during their second semester.

To be admitted for graduate study in nuclear engineering, students are required to:

- Have an undergraduate degree (with a strong math and physics background) in an engineering field, physics, biology, chemistry or mathematics from an accredited institution with a minimum GPA of 3.0 (A=4.0) in the last two years of undergraduate study
- Take the GRE before admittance; foreign students also should submit scores from the TOEFL
- Have three letters of recommendation, from previous instructors or technical employers who are familiar with the student's qualifications for graduate study, sent directly to the Nuclear Engineering Graduate Studies Office, E2433 Engineering Building East, Columbia, MO 65211. (If the student is applying to the PhD program, one of these letters must be from the MS adviser.)
- Have transcripts from all college or university course work sent to the Nuclear Engineering Program Graduate Studies Office
- Submit an application for admission to the nuclear engineering program graduate studies office.

If the student is entering the PhD program, the planned course of study will be individually evaluated by the nuclear engineering faculty.

The PhD program is a research program and is tailored to meet specific educational needs. To qualify for the research phase of the PhD program, the student must pass a comprehensive, multi-part qualifying examination, usually administered during the first semester of study for the PhD.

DEGREE REQUIREMENTS: The nuclear engineering master's degree program requires 31 hours, including a research project or thesis. The requirements are based on the assumption that the student is entering graduate study with a bachelor's degree in engineering from an ABET-accredited school. Students with degrees in physics or chemistry are generally adequately prepared for the nuclear engineering graduate program. Those from other backgrounds may be required to complete engineering undergraduate courses in thermodynamics, advanced engineering mathematics and the full complement of calculus-based physics, based on the student's particular experience. The PhD degree is a research degree, with a suitable dissertation topic to be chosen in the respective field and usually requires 24 classroom credits of advanced courses beyond the MS degree.

Several emphasis areas of study are available to students. Two options exist with emphasis on **power engineering**: 1) a basic nuclear engineering program (for students emphasizing fission or fusion processes), and 2) a nuclear power engineering program (for students with bachelor's degrees in electrical engineering). Students in either of these programs must meet the basic criteria for entering graduate study in nuclear engineering.

An option in **health physics** is devoted to the study of the protection of people and the environment from radiation and environmental contaminants. Health physics is concerned with dosimetry, shielding design, radiation biology and instrumentation development, and the development and implementation of the methods and procedures to evaluate and deal with environmental hazards (particularly with the measurement and effects of low levels of radiation, both natural and man-made, in the environment). The program includes a one- to two-credit practicum in a job training setting, and a three-credit research project. Students pursuing a PhD in this option will select a suitable dissertation topic in nuclear engineering, with emphasis in health physics.

The **medical physics** option emphasizes five areas of study: radiology, diagnostics, nuclear medicine, radiation therapy, and health physics applications in medical practice. Medical physics applies physics and engineering concepts and methods to the diagnosis and treatment of human

disease with emphasis on engineering design and utilization of the machines for this purpose. The curriculum includes a three-credit research project and a practicum as in the health physics options. Students pursuing a PhD in this option will select a suitable dissertation topic in nuclear engineering, with emphasis in medical physics. Students are expected to arrange for their own practical training if they have interest in entering the clinical field.

COURSES

NUCLEAR ENGINEERING

300—Special Problems (1-5).

301—Topics in Nuclear Engineering (2-5). Current and new developments in nuclear engineering. Prerequisite: instructor's consent.

302—Safe Handling of Radioisotopes (1). Introduction of methods and procedures for safe handling of radioisotopes in the research laboratory. Intensive lecture and laboratory training sessions designed for persons planning to use radioisotopes at the University. Prerequisite: instructor's consent.

303—Radiation Safety (3). Types and origins of radiation; radiation detection and measurement; radiation interactions; shielding; dose calculations; federal, state and local regulations; and procedures for safe uses of radiation. Laboratory experiments in radiation measurements and protection. Prerequisite: college physics, calculus based.

305—Survey of Nuclear Engineering (3). Introductory topics in nuclear engineering. Atomic and nuclear physics; nuclear reactor principles under steady-state and transient conditions; heat removal; shielding; instrumentation; power generation; fusion. Prerequisite: Physics 124. Concurrent with Mathematics 304.

306—Advanced Engineering Math (3). (same as Chemical Engineering 306).

315—Energy Systems & Resources (3). (same as Electrical Engineering 315, Mechanical & Aerospace Engineering 315).

320—Natural Resources and Nuclear Energy (3). Not for engineering students. Lecture, demonstration; describes physical environment, energy, power plants, nuclear reactors; radioactivity, its biological effects; health physics measures, rad-waste disposal; nuclear safeguards, nuclear explosives, societal implications. Prerequisite: high school algebra.

328—Introductory Radiation Biology (3). (same as Biological Sciences 328, Radiology 328, Veterinary Medicine & Surgery 328).

341—Nuclear Chemical Engineering (3). Principles and processes of importance in the field of nuclear technology.

346—Introduction to Nuclear Reactor Engineering I (3). (same as Mechanical & Aerospace Engineering 346 and Electrical Engineering 346).

349—Nuclear Engineering Materials (3). Properties of materials for reactor components; radiation damage and corrosion; metallurgy of reactor materials. Prerequisites: upper division or graduate standing in Physical Sciences or Engineering, or instructor's consent.

350—Nuclear Methods in Bioenvironmental Studies (3). Principles/applications of nuclear techniques in solution of bioenvironmental problems. Uses of nuclear methods in studies of water/air pollution, biology, medicine, pesticides, geochemistry, ecological transport. Lectures, laboratory. Prerequisites: senior standing or instructor's consent.

353—Introduction to Fusion (3). Basic plasma physics, principles of thermonuclear fusion, plasma confinement and heating, and devices. Prerequisites: senior standing in Engineering or Science or instructor's consent.

365—Nuclear Power Engineering (3). Nuclear reactor heat generation and removal; nuclear reactor coolants; analysis of nuclear reactor power plants. Prerequisite: Engineering 99.

375—Introduction to Plasmas (3). (same as Electrical Engineering 375, Mechanical & Aerospace Engineering 375).

379—Particulate Systems Engineering (3). An introduction to natural and engineered particulate systems. Prerequisites: Chemical Engineering 234 or Mechanical and Aerospace Engineering 299 or equivalent.

382—Lasers and Their Applications (3). (same as Electrical & Computer Engineering 382, Mechanical & Aerospace Engineering 382).

391—Nuclear Radiation Detection (3). Principles and application of radiation detectors and analyzers: ionization, Geiger-Muller, proportional, liquid and solid scintillation, semiconductor, pulse height analyzers, coincidence circuits, data reduction, tracer applications, activation analysis. Lectures, laboratory. Prerequisites: senior standing or instructor's consent.

400—Problems (1-6). Supervised investigation in nuclear engineering to be presented in the form of a report.

401—Advanced Topics in Nuclear Engineering (3). Advanced developments in nuclear engineering. Prerequisite: instructor's consent.

402—Nuclear Fuel Cycle (3). Covers the nuclear fuel cycle from mine through enrichment, fuel element burnup reactor physics, chemical reprocessing, waste disposal, with special emphasis on the newer proliferation-resistant fuel cycles. Prerequisites: 346 or 305 and instructor's consent.

403—Applied Topics in Medical Physics & Health Physics (1-6). Directed observations and experience in scientific aspects of daily operations in nuclear medicine, diagnostic radiology, radiotherapy and health physics. Prerequisite: departmental consent.

404—Nuclear Reactor Laboratory I (3). Application of reactor physics principals to operation of and experiments with the University of Missouri Research Reactor. Neuton activation analysis, instrumentation, reactivity evaluation. Prerequisites: 346 or 411.

405—Nuclear Reactor Laboratory II (3). Advanced experiments to measure diffusion length, Fermi age, material buckling, transfer function, neutron spectrum and other reactor characteristics. Reactor simulation with an analog computer. Prerequisite: 355, 411 or instructor's consent.

406—Clinical & Research Application in Medical and Health Physics (1). To give students an understanding of the range of clinical practice and medical research involving the practice and nuclear physics/engineering. Prerequisites: 409 & 303, college calculus or equivalent & calculus based physics.

408—State Variable Methods in Automatic Control (3). (same as Chemical Engineering 408, Electrical & Computer Engineering 408, Mechanical & Aerospace Engineering 408).

409—Interaction of Radiation with Matter (3). Theory/applications of radiation interaction processes. Reviews nuclear physics concepts; radioactive decay; sources/spectra of ionizing radiation; collision mechanisms for changed particles, electromagnetic radiation, neutrons for interaction with matter. Prerequisite: Entrance requirements.

410—Seminar (1). Reviews of investigations and projects of importance in nuclear engineering.

411—Nuclear Reactor Theory I (3). Nuclear reactions; nuclear fission; introduces neutron transport; diffusion and slowing down of neutrons; steady-state homogeneous and heterogeneous reactor theory. Prerequisites: 347 or instructor's consent.

412—Nuclear Reactor Theory II (3). Linear and non-linear reactor kinetics; perturbation theory; temperature and fission product effects; control rod theory; transport theory. Prerequisites: 411 or 346 & 347.

421—Advanced Radiation Detection Electronics (3). Principles of radiation pulse analysis with emphasis on applications. Radiation detection devices; amplifying, shaping and discrimination circuits; nuclear pulse analysis; automated data analysis systems. Lectures and lab. Prerequisites: 346, 391 or instructor's consent.

429—Radiation Dosimetry (3). Basis and applications of conventional and microscopic radiation dosimetry. Dose concepts and quantities; biological dose-response models; dose measurement principles; photon, charged particle, and neutron dosimetry. Prerequisite: 409. Recommended: 328.

432—Nuclear Thermal Hydraulics and Safety (3). Engineering topics from reactor heat transfer and thermal stresses, fuel cycle analysis, power plant thermodynamics, shielding, and reactor safety analysis. Prerequisites: 411 or 346, or instructor's consent.

434—Fracture Mechanics I (3). (same as Mechanical & Aerospace Engineering 434).

435—Physics of Diagnostic Radiology I (3). Principles and applications of X-ray production and interactions. Images production concepts including X-ray film, intensifying screens, grids, fluoroscopy, image intensification and television monitors. Image quality analysis and assessment. Prerequisites: 409 or equivalent or instructor's consent. w.

439—Clinical Physics in Radiotherapy (3). Principles and applications of radiation producing units, exposure and dose measurements, and calibration. External beam physics parameters and application to fixed field and rotational field treatment planning. Prerequisite: 409 or equivalent or instructor's consent.

444—Fracture and Fatigue Prevention in Engineering Practice (3). (same as Mechanical & Aerospace Engineering 444).

450—Superconductivity and Its Applications (3). (same as Mechanical & Aerospace Engineering and Electrical Engineering 450). Phenomenology and theory of superconductivy; cryogenic practice; metallurgy of superconductin elements, alloys and compounds. Applications, present and prospective. Graded on a S/U basis only.

451—Computational Methods of Reactor Analysis (3). Applies numerical analysis and digital computation to topics from multigroup diffusion theory, transport theory, reactor kinetics, reactor thermal hydraulics, radiation shielding, reactor safety. Prerequisites: 304, 411, or Mathematics 307 or Mathematics 323.

452—Ultrasound and Magnetic Resonance Imaging (3). The physical principles of MRI and ultrasound including clinical instrumentation, artifacts in images, biological effects and quality control. Images obtained with both techniques will be presented. Prerequisite: 391, 409, 306 or equivalent.

453—Advanced Fusion Theory (3). Plasma stability theory, charged particle diffusion, slowing down of charged particles, interaction of radiation with matter, direct energy conversion using charged particles, and engineering considerations. Prerequisites: 353 and 375 or Physics 445 or instructor's consent.

454—Clinical Physics of Nuclear Medicine (3). Physical principles, statistics of radionuclide decay and highlights into the most current instrumentation to utilize invivo radionuclides for both diagnostic imaging and therapy. Also includes brachy therapy. Prerequisite: 306, 310, 409 or equivalent.

455—Growth, Characterization & Appl. of Diamond & Related Materials (3). This course explores the development of diamond films. Discussion of other wide band gap materials are covered. Topics include Chemistry of Diamond Growth, Thermodynamics, Nucleation, Methods of Growth, Methods of Impurity Control, Characterization and Modification, Doping, and Applications.

461—Neutron Transport Theory (3). The Boltzmann equation; general properties and solution; numerical methods of solving the transport equation; neutron thermalization and neutron spectra. Prerequisites: 412; Mathematics 305, 307, or instructor's consent.

470—Fast Reactor Analysis (3). Analytical methods for designing fast breeder reactor systems. Prerequisites: 412,

432, 451 or instructor's consent. Graded on a S/U basis only.
471—Radiation Protection (3). Theory and applications of radiation protection and health physics. Radiation dosimetry methods and calculations, shielding evaluations, equipment surveys and inspection, environmental monitoring, radiation standards and regulations and administration presented. Prerequisites: 303 & 328.
490—Research (1-99). Independent investigation in nuclear engineering to be presented as a thesis. Graded on a S/U basis only.

Nursing

S235 Sinclair School of Nursing Building
(573) 882-0277
e-mail: sinclair@showme.missouri.edu

FACULTY

Rosemary Porter, associate dean of student affairs, director of graduate studies, associate professor, PhD, University of Missouri-Columbia. Administration, adult nursing.
Vicki Conn, research co-director, associate professor, PhD, University of Missouri-Columbia. Adult nursing, geriatric nursing.
Jane Armer, research co-director, associate professor, PhD, University of Rochester. Rural community health, gerontology.
Larry Ganong, co-director PhD program, professor, PhD, University of Missouri-Columbia. Family counseling and therapy.
Eileen Porter, co-director PhD program, assistant professor, PhD, University of Wisconsin-Milwaukee. Family and community health nursing.
Elizabeth Geden, professor, PhD, University of Missouri-Columbia. Family nurse practitioner.
Susan Taylor, professor, PhD, The Catholic University of America. Adult nursing.
Alice Kuehn, associate professor, PhD, University of Missouri-Columbia. Family and gerontologic nurse practitioner.
Priscilla LeMone, associate professor, DSN, University of Alabama-Birmingham. Adult nursing.
Kay Libbus, associate professor, DrPH, University of Texas-Houston. Community health, primary care.
Roxanne McDaniel, associate professor, PhD, University of Texas-Austin. Adult nursing.
Marilyn Rantz, associate professor, PhD, University of Wisconsin-Milwaukee. Nursing administration, gerontological nursing.
JoAnne Banks-Wallace, assistant professor, PhD, University of Washington. Public health.
Linda Bullock, assistant professor, PhD, University of Otago Medical School. Obstetrics, public health nursing.
Deborah Finfgeld, assistant professor, PhD, University of Texas-Austin. Community mental health nursing.
Victoria Grando, assistant professor, PhD, University of Kansas. Community mental health nursing.
Deidre d'Amour Wipke-Tevis, assistant professor, PhD, University of California-San Francisco. Adult health.
Karen Marek, professor of clinical nursing, PhD, University of Wisconsin-Milwaukee. Community health, administration.
Donna Scheideberg, associate professorof clincal nursing, PhD, Michigan State University. Nurse midwifery.
Cheryl Bausler, assistant professor of clinical nursing, PhD, University of Missouri-Columbia. Adult health.
Debra Gayer, assistant professor of clinical nursing, PhD, University of Missouri-Columbia. Adolescent health care.

DEGREES: MS and PhD in Nursing

Graduate students in the School of Nursing have access to all campus libraries and the various services they provide. The School of Nursing building is next to University Hospital and Clinics, which includes the Rusk Rehabilitation Center and Ellis Fischel Cancer Center. Other clinical agencies in the immediate vicinity include Truman Veterans Hospital and Mid-Missouri Mental Health Center. A variety of learning experiences also are available at other hospital and health agencies in and around Columbia.

Financial assistance is available as scholarships, fellowships, assistantships and trainee-ships. ***For additional information write the Student Affairs Office, S235 School of Nursing, Columbia, MO 65211.***

MASTER'S DEGREE: Students in the Master of Science program obtain advanced practice preparation in one of three areas: Health Restoration/Support; Health Promotion/Protection; or Health Care Systems. All these areas of study are available at the doctoral level.

HEALTH RESTORATION/SUPPORT: Students in this area prepare as clinical nurse specialists/case managers. An area of specialization is achieved by the selection of a population of choice across the lifespan. Also, students may choose to focus on the role of educator, administrator, or some combination of these roles, such as clinical nurse specialist/educator.

HEALTH PROMOTION/PROTECTION: Students in this area may prepare for certification as clinical nurse specialist in mental health. Students pursuing this area learn mental health assessment and intervention skills for individuals and groups. Psycho–education methods, such as stress management, self-esteem enhancement and assertion skill building are emphasized. Graduates provide advanced mental health, promotive and restorative care to individuals, families and groups. The roles of educator and administrator are available as well.

Students may elect to prepare as Public Health Clinical Nurse Specialists. The graduates in this area will provide leadership in local and state public health agencies and policy-making bodies in the enactment of community and population-focused, item-based approaches to the provision of public health and primary health care, including health promotion, disease prevention, case finding and referral.

Health Promotion/Protection students may also choose the family nurse practitioner or gerontological nurse practitioner role. These students learn to perform physical examinations and health assessments. The nursing focus is on managing common episodic and chronic illness.

The nurse-midwifery area of study admitted its first students in fall 1995. Students in this area prepare to become certified nurse-midwives, and area educated in both nursing and midwifery. Nurse-midwives are specialist in normal pregnancy, labor and birth, healthy newborns and well-woman gynecologic and family planning health care.

HEALTH CARE SYSTEMS: This area prepares students for nursing administration careers. Graduates generally enter the work force as middle-managers in acute care or community settings. In addition to study in areas such as business, organization theory and personnel management, students may include a minor in business administration.

ADMISSION REQUIREMENTS FOR MS DEGREE. To be accepted as a candidate for the degree, the following is required:

- A degree from a baccalaureate nursing program accredited by the National League for Nursing
- A minimum GPA of 3.0 (A=4.0) for the last 60 credit hours of the baccalaureate degree
- Evidence in the form of letters of reference from two qualified people able to predict the applicant's ability to succeed in graduate study
- Licensure as a Missouri Registered Professional Nurse
- A total score of 1500 on the three sections of the GRE is preferred. The GRE must have been taken within five years before application.

ADMISSION TO NURSE PRACTITIONER AND NURSE-MIDWIFERY AREAS OF STUDY. Nurse practitioner and nurse-midwifery applicants compete for admission, with programs beginning in the summer and fall only. In addition to the requirements for the nursing master's program and graduate school, admission to the nurse practitioner area and nurse-midwife is based on the following criteria: (1) undergraduate GPA for the last 60 hours; (2) Graduate Record Examination scores; (3) one to two years of clinical experience as an RN; (4) intention to work in under served areas; (5) Missouri residency. Special consideration may be given to students who have demonstrated unusual motivation toward their nursing careers, and whose background demonstrates substantial economic or cultural disadvantages. Prospective nurse practitioner and nurse-midwifery applicants must meet the following requirements:

1. Admission to graduate nursing program by December 1 to be considered for following summer or fall semester admission.
2. Submission of an additional letter of recommendation from a former or current employer that addresses an applicant's potential for functioning in the advanced role (clinical decision-making experience, clinical skill level, collaborative skills with other health professionals, clinical nursing leadership).
3. An interview by a nurse practitioner (or nurse-midwifery) faculty member for selected applicants. After all interviews are complete, applicants will be notified of their status by April 15.

DEGREE REQUIREMENTS FOR THE MS DEGREE. To satisfy requirements for the MS, a student must:

- Complete an approved program with a cumulative GPA of 3.0
- Successfully defend a written thesis, research

project or practicum paper
- Complete the program within a five-year period

DOCTORAL DEGREE: The PhD Program in Nursing, prepares nurse-scholars to:
- Assume leadership roles in nursing and health care
- Advance the body of knowledge that guides the practice of nursing
- Conduct nursing research
- Participate in developing social and health policy.

There are two curriculum options: (a) post-baccalaureate (BSN-PhD) and (b) post-masters (MSN-PhD). For both options, the doctoral curriculum is divided into three general categories of knowledge:
- nursing content areas (nursing theory analysis and development; nursing applied sciences)
- modes of inquiry (philosophy of science, statistics and measurement, qualitative and quantitative methods courses in nursing and other disciplines)
- a collateral field outside the discipline of nursing.

Doctoral-level courses are required in nursing theory analysis and development (N415 and N416). Students must take 6 credits of supervised research practica (N486). Courses to fulfill the remaining degree requirements are planned by the student and the doctoral program committee.

As a general focus, each student selects one of three substantive areas of nursing science. The three categories of knowledge are integrated in doctoral seminars based upon the substantive areas; students are required to take at least one seminar (N485, N497, N498, or N499). Students in **health care systems** study:
- Nursing and health-care delivery models
- Political and historical development of models such as primary care, primary nursing, case management and managed care
- Informatics and intelligence systems.

Students who select **health promotion and protection** as a substantive area address concepts related to individual self-care and family care systems to promote and maintain health and to reduce risks for illness or injury, including:
- Health-promoting behaviors of pregnant and parenting adolescents
- Dependent adult and elderly care
- Prevention of domestic violence of spouse, child or elder abuse
- Promotion and support of breast-feeding among minority and low-income families
- Women's health issues
- Prevention of sexually transmitted diseases and AIDS
- Prevention of children's exposure to toxins.

Finally, students who work in **health restoration and support** address human responses to acute, critical, and chronic health conditions. Included among the populations of interest are individuals and families at risk for health crises such as:
- Individuals with cancer
- Physiological and pychosocial characteristics of frail elderly and family caregivers
- Individuals with problems of mobility
- Families with handicapped children or apneic infants
- Persons of all ages who are experiencing pain.

The PhD in Nursing is offered cooperatively by the three Schools of Nursing in the University of Missouri System. Courses are cross-listed by the three campuses to enhance program flexibility. Specific courses are telecommunicated to give students the benefit of faculty expertise on all three campuses. Faculty from the campuses co-teach the doctoral program seminars. Students may select doctoral program committee members from the other campuses, but the campus of the student's major adviser is the students' primary campus, where the residency is done and the PhD degree is awarded.

ADMISSION REQUIREMENTS FOR THE PHD PROGRAM: Doctoral students are admitted at various times during the academic year. For the BSN-PhD Option, applicants are evaluated for admission based on these criteria:
- Graduate of an accredited baccalaureate program with a 3.2 minimum GPA (4.0 scale)
- Graduate Record Examination (GRE) within the preceding 5 years
- Three letters of reference
- Original essay on professional goals.

In addition to these requirements, for the MSN-PhD Option, applicants are evaluated for admission based on this criterion:
- Graduate of an accredited master's program with a 3.5 minimum GPA.

After application materials are reviewed based on the above criteria, applicants may be invited for an interview.

PROGRESSION REQUIREMENTS: The PhD in Nursing requires a minimum of 72 credits beyond the baccalaureate degree; the doctoral program committee sets the total hours. For students in the MSN-PhD option, 24 to 30 credits may be applied from the master's degree in nursing.

BSN-PhD students are admitted to the program on a provisional basis. Successful completion of a qualifying process is required for official admission to the program. To qualify, students must earn at least a "B" in these BSN-PhD core courses: N310, N390, Stat 292, and three (3-credit) courses in nursing applied sciences. The student initiates the qualifying process by enrolling in 3 credits of N470 with a member of the program committee. The student fulfills the N470 requirement for a written report by writing: (a) a predoctoral fellowship application, (b) a manuscript in publishable form, or (c) a formal research paper. In evaluating the student's research skills, knowledge base, and potential as a scholar through the N470 paper and oral presentation, the program committee decides whether the student should be officially admitted. The qualifying process may be repeated once, by enrolling again in N470 for three credits.

Upon successful completion of the admission process, MSN-PhD students are considered qualified for official admission.

The student fulfills the residency requirement by taking 9 credits in each of two semesters of 6 credits in each of three semesters in an 18-month period. Up to 6 residency credits may be earned though telecommunicated courses.

To attain candidacy, students must successfully complete all courses on the plan of study, and pass the written and oral components of the comprehensive examination. A dissertation, which is written on a subject approved by the program committee, represents the results of an original investigation.

INTERNATIONAL STUDENT ADMISSION FOR MS AND PHD DEGREE: Upon request for information or forms for admission, the Office of Student Affairs in the School of Nursing will notify the Coordinator of International Student Programs. The Student Admissions and Progression Committee of the School of Nursing may not act upon any international application for admission until the applicant has been cleared through the office.

Besides the requirements set forth by the Office of International Student Programs, the graduate program in the School of Nursing requires the following criteria for admission of international students:
- A minimum score of 550 (paper-based) and 213 (computer based) on the TOEFL (Test of English as a Foreign Language)

Besides the TOEFL, both the Test of Written English (TWE) and the Test of Spoken English (TSE) will be required.

A score of 4 on the TWE is required. An applicant with a score of 3 on the TWE will be considered for admission if other criteria are strong. Required scores for the four scales of the TSE are:
- 2.16 for comprehensibility
- 2.13 for pronunciation
- 2.36 for grammar
- 2.16 for fluency

Applicants with lower scores on the TSE will be considered on an individual basis if other criteria are strong.
- A temporary license to practice nursing in the State of Missouri. This license must be obtained before admission.
- Passing scores on all sections of the State Board Test Pool Examination. This examination must be written on the first testing date following award of the temporary license. Failure on any section of the State Board Examination necessitates dismissal from the Graduate Program in Nursing.

COURSES

300—Problems (1-3). Guided readings, special study, and/or a practicum in an area of the student's interest or an area which the student needs to strengthen. Prerequisite: instructor's consent. f,w,s.

301—Special Topics in Nursing (1-3). Specialized topics in advanced nursing not available through regularly offered courses.

302—Cultural Expeditions in Rural Nursing (3). Directed field experiences in a variety of rural settings exploring local customs and cultural/ethnic diversities influencing health care delivery. Prerequisite: 162 or instructor's consent. Graded on S/U basis only.

303—Human Health and the Environment (3). Examination of relationships between human health and global environmental quality. Overview of assessing, communicating, and managing environmental risks within the framework of public health's core functions.

304—Stress Management (3). Review of contemporary research on the causes, prevention, and treatment of stress. Examination of utility and validity of a variety of stress reduction methods. Development of selected self-management skills. w.

305—Women's Health (3). (same as Women's Studies 305). A survey of international and domestic women's health issues; considers historical antecedents and specific effects of socio-cultural variables and economic development on women's health in developing and developed nations.

306—Legal Parameters of Nursing (3). This course provides the basic doctrines and principles of the law foundational to legally sound nursing practice. Included among significant topics are tort law, nurse practice act, licensure, effect of contract law.

309—Practice of Gerontological Nursing Within a Self-Care Framework (3). Designed to increase the nurses' knowledge and application of theory-based gerontological nursing by integrating gerontological nursing content with Self-Care Nursing Theory. Prerequisite: instructor's consent.

310—Theories in Nursing (3). Analysis, application and evaluation of nursing theories with special emphasis on Orem's Self-Care Deficit Nursing Theory. Metaparadigm, grand and middle range theories as well as theory development will be examined.

311—Trends and Issues in Nursing (3). Issues and trends involving professional nursing practice are examined from socioeconomic, organizational, legal and ethical perspectives. Past, present and future roles and practice of nurses are examined.

313—Theories of Development and Psychopathology (3). Theories and empirical research related to psychosexual and psychosocial development, perception, cognition and moral development evaluated for ability to explain or predict behavior throughout the life cycle.

333—Health Appraisal of Individuals and Families (3-4). Health assessment techniques expanded. Introduces concepts of wellness health risk factors. Emphasizes design of nursing systems for individuals/families in ambulatory care settings. Prerequisite: instructor's consent. f.

340—Clinical Pharmacology (3). Emphasis on drug therapy management of various client populations in the primary care setting.

341—Advanced Health Assessment and Promotion (3). Health assessment techniques are expanded. Introduces concepts of well-being, assessment of health risk factors and illness behaviors across the lifespan. Emphasizes design of nursing systems. Prerequisite: BSN or instructor's consent.

350—Case Management for Advanced Nursing Practice (3). Examines case management as nursing care delivery system/ interdisciplinary model of health care. Emphasizes coordination of health care across diverse setting with individuals/families at risk for poor health outcomes. Pre or Corequisite: 310.

381—Teaching Nursing (3). Principles and methods of teaching, evaluation, and curriculum construction in undergraduate nursing education. Prerequisite: Educational & Counseling Psychology A301 or equivalent.

390—Research Methods in Nursing (3). Rationale of scientific research; research methodology pertinent to nursing problems; hypothesis formulation, selection of appropriate design, instruments and analysis. Prerequisite: 310, concurrently and appropriate statistics.

400—Problems (1-4). Guided readings, special study and/ or a practicum in an area of the student's interest or in an area which the student needs to strengthen. Prerequisites: instructor's consent. f,w,s.

401—Topics in Advanced Clinical Nursing (3). Specialized topics in advanced clinical nursing not available through regularly offered courses.

402—Primary Care for Women (3). Focuses on the etiology, symptomatology, diagnosis, and management of primary health care problems as they relate to women from adolescence through the climacteric. Co-/Prerequisite: 341 or instructor's consent. w.

403—Nurse-Midwifery Management: Newborn Care (4). Critical analysis of theory, research, knowledge related to nurse-midwifery care of neonate and family adaptation. Nurse- midwifery management of newborn's adaptation to extrauterine life, breastfeeding, family interactions and complications. Clinical practicum required.

404—Nurse-Midwifery Management: Well-Woman Gynecology (4). Critical analysis and application of current well-woman care, gynecological theory, knowledge and research. Nurse-midwifery management models for well-woman/GYN care emphasized. Clinical practicum required. Prerequisite: current enrollment in 341 and instructor's consent.

405—Nurse-Midwifery Management: Antepartum Care (4). Critical analysis and application of theory, knowledge, research relating to care of women/families during pregnancy. Nurse midwifery management of normal pregnancy, variations, and social implications emphasized. Clinical practicum required. Prerequisites: N404.

406—Nurse Midwifery Management: Intrapartum Postpartum Care (4). Critical analysis of theory, research, knowledge related to nurse midwifery care of intrapartum, postpartum women/infants/ families. Nurse midwifery management of spontaneous/assisted labors, births, postpartal care, complications. Clinical practicum required. Prerequisites: N403, N405.

410—Clinical Applications of Self-Care Deficit Theory (3-5). Application of nursing theoretical constructs for selected clients to describe and classify nursing cases, apply processes of diagnosis, prescription, and care provision and evaluation. Prerequisites: 310, 414, 441 or instructor's consent.

411—Epidemiology for Public Health Practice (3). Explores important concepts of epidemiology, including distribution and determinants of disease. Focus will be on the public health/population based practice. Prerequisite: Statistics 292 or equivalent or faculty permission.

412—Family Dynamics and Intervention (3). (same as Human Development and Family Studies 412). Theories of family function and dysfunction; techniques of assessment; models of family intervention. Practicum with selected families.

414—Physiological Concepts for Nursing (3). Focus on biophysiological knowledge that contributes to an understanding of health deviations and related nursing interventions. Common physiological concepts with clinical relevance for the advanced practice nurse are explored. Prerequisite: current enrollment in graduate school.

415—Conceptual Structure of Nursing (3). Conceptualization and theoretical analysis of nursing phenomena; critical evaluation of nursing theories. Prerequisite: 310.

416—Nursing Practice Theories and Models (3). Development of practice theory, and practice models from the perspective of various populations and other theories; development of procedures and protocols. Prerequisites: 310, 415

417—Foundations in School Health Nursing (3). The student will learn the public health principles of leadership, collaboration, advocacy, communication and policy formation as they relate to the school setting. Prerequisite: 310.

418—Special Health Care Needs of Children in the School Setting (3). The student will learn to assess factors impeding a child's learning, determine services needed, so the child can experience academic achievement. Prerequisite: 310.

424—Clinical Manage. in Primary Health Care I: Adults Through Aging (3). Health maintenance of adults and older adults. Design, implementation, evaluation of nursing management of acute and chronicproblems. Integrated clinical practicum. Issues of clinical management within advanced practice role. Prerequisite: 341.

425—Clinical Manage. in Primary Health Care II: Adults through Aging (3). Continuing emphasis on nursing management of selected acute and chronic problems. Clinical preventive services; integrated clinical practicum. Nurse practitioner role within changing health care system. Prerequisite: 424.

426—Primary Health Care Management: Newborn Through Adolescence (3). Infant-child health maintenance/ promotion. Nursing management of common childhood illness, behavioral, developmental problems. Advanced knowledge of human growth, development, family dynamics, community resources, collaborative relationships. Integrated clinical practicum. Prerequisite: 341.

427—Primary Health Care Mangement: Reproductive and Sexual Health (3). Reproductive, sexual issues, adolescence through aging. Design, delivery, evaluation of nursing management of women, reproductive health care of men. Stresses personal health promotion. Prerequisite: 341.

428—Primary Health Care Management: Aging Indviduals and Families (3). Health promotion, wellness, concepts of normal aging. Design, delivery, evaluation of primary health care nursing management of problems of aging individuals, families. Prerequisites: 341 or instructor's consent.

429—Aging Individuals (3). Continuing emphasis on health promotion, wellness, concepts of normal aging. Nursing management of complex health care problems of individuals and families, late middle age, aging. Prerequisite: 428.

431—Concepts for Specialization in Public Health Nursing (3). Key concepts fundamental to specialization in public health nursing, including core public health functions. Emphasis upon integrating public health science, nursing theory, and methodological/leadership skills. Pre- or corequisite: 310.

432—Community-Based Public Health Interventions (4). Assessing and diagnosing health-related needs of at-risk and vulnerable populations. Evaluating outcome-based research. Clinical practice implementing a public health intervention. Pre-requisites: 431, Family & Community Medicine 420, Statistics 292. Pre or Co- requisite: 390

433—Developing and Evaluating Public Health Programs (3). Designing and implementing cost-effective programs in public health agencies serving specific geographic jurisdictions. Controversies associated with specifying and appraising outcomes of public health programs. Prerequisite: 341. Pre-or concurrent requisite: 470.

438—Advanced Public Health Theory (3). Explores concepts of public health with a focus on the advanced practice nurse in population-based/primary care practice; core public health functions will be addressed at three service levels—the aggregate, the family, and the individual. Prerequisite: 310.

450—Clinical/Scholarly Project (1-3). Design implement and evaluate nursing projects derived from theory, including written report with explanation or justification to support the empirical and/or theoretical basis for the project. Prerequisites: 310, 390. Graded on a S/U basis only. f,w,s.

452—Health Promotion and Restoration in Mental Health Nursing (3). Application of group and behavioral methods in mental health prevention, promotion, maintenance, and restoration. Designing, implementing, and evaluating mental health promotion groups and social skills training programs. Prerequisite: N310 or concurrent.

454—Nursing Interventions in Psychosocial Crisis (3). Develops advanced nurse agency in the assessment, treatment, evaluation of individuals experiencing critical levels of psychosocial stress. Emphasis on crisis intervention theory within a framework of Self-Care Deficit Nursing Theory. Prerequisite: 310 or concurrent. w

456—Diagnostics and Psychopharmacology for Mental Health Nurses (3). Emphasis is on the neurobiologic basis

and diagnosis of mental health problems and advanced nursing management of psychiartric conditions using pharmaceutical agents. Prerequisites: 340, 341, 414.

462—Advanced Clinical Practice with Selected Patient Populations (3). 1) didactic, 2) clinical. Focus is support/restoration of selected patient populations. Emphasizes identifying patient problems-nursing interventions requiring advanced knowledge. Explores clinical management of advanced nurse practice role. Pre/corequisites: 341, 350.

463—Knowledge & Skills f/Adv. Practice w/Selected Patient Populations (3). Readings for this course allow the student to develop depth and breadth of knowledge and skills for advanced practice nursing with a selected patient population. Prerequisite: 462.

464—The Continuum of Care (3). 2) didactic 1) clinical. Examines settings wherein care is given, focusing on impact of setting on patient, delivery models/personnel providing care. Focuses on role/structure of care in various setting. Pre/Corequisite: 350.

470—Research Practicum (1-3). Selected independent research activities in conjunction with ongoing research programs of faculty. Written report required. Prerequisites: 390, instructor's consent. Graded on a S/U basis only. f,w,s.

472—Clinical Management of Patient Care (3). Course for nurse managers at management level with complete responsibility for limited areas in nursing. Focuses on management of nursing units demonstrating quality nursing practice. Prerequisite: 471 or instructor's consent.

478—Nursing Administration (3). Examines organizational/leadership theories and their application to nursing service administration. Selects concepts, theories and paradigms to identify/investigate current nursing administrative practices. Role specifics of a nurse administrator are examined. Prerequisite: 472 or instructor's consent. f.

479—Nursing and Health Policy (3). Exploration and critical evaluation of the role of nursing and and nurse leaders/scholars in health policy development in response to health and social needs of the public. Prerequisites: 311 or equivalent, and permission of instructor.

480—Advanced Clinical Nursing Practicum (3-6). A preceptored or faculty-guided intensive clinical experience focused on synthesis and application of previous theory and clinical courses and development of an autonomous nursing practice role. Prerequisites: 390, and instructor's consent. Graded on S/U basis only.

481—Teaching Practicum (3). Participation in application of principles and methods of teaching, learning, and evaluation to the education of nursing students. Prerequisite: 381. S/U graded only. w.

482—Nursing Administration Practicum (3). The practicum and seminar minimizes the gap between knowledge about nursing administration and producing a viable solution in an action context. Examination of theories and application to nursing service. Prerequisite: 478. w.

485—Seminar (1-99). Course content varies. Prerequisite: graduate standing or instructor's consent. May be repeated to a maximum of six hours.

486—Advanced Research Practicum in Nursing (1-6). Supervised experience in nursing research prior to candidacy. Activities designed by student, faculty mentor, and program committee based on student's expertise in research methods and substantive areas and probable research trajectory. Includes seminar. Prerequisite: 416 and departmental consent. Graded on S/U basis only.

489—Health Policy Practicum (3). Field experiences for exploring and critically evaluating health policy shaping activities of nurse leaders/scholars as they respond to health and social needs of the public. Mentored practicum. Prerequisites: 479 and permission of instructor.

490—Research in Nursing (1-99). Origin investigation for presentation as thesis or dissertation. Instructor's consent. Graded on a S/U basis only. f,w,s.

491—Advanced Research Methods in Nursing (3). Study of explanatory and predictive quantitative designs in nursing science. Designs may include nested, double-blind, time series, casual models, retrospective cohort. Use of secondary databases will be explored. Prerequisite: 390, Advanced Statistics.

495—Nursing Phenomena I (3). Examines the following selected qualitative research approaches appropriate for the study of nursing phenomena and the extension or modification of scientific knowledge so as to be relevant to nursing: case study research methods, verbal qualitative approaches, and nonverbal qualitative approaches. Prerequisite: 390.

496—Nursing Phenomena II (3). Examines techniques used to estimate the various types reliability and validity of psychological and biological measures of nursing phenomena as well as the appropriate use of existing measures. Prerequisites: 390, 495.

497—Advances in Health Care Systems (3). Guided in-depth exploration, analysis, and evaluation of selected nursing and other current literature in health care systems. Prerequisite: 415, doctoral standing or instructor's consent.

498—Advances in Health Restoration and Support (3). Guided in-depth exploration, analysis, and evaluation of selected nursing and other current literature in health restoration and support. Prerequisite: 415, doctoral standing or instructor's consent.

499—Advances in Health Promotion and Protection (3). Guided in-depth exploration, analysis, and evaluation of selected nursing and other current literature in health promotion and protection. Prerequisite: 415, doctoral standing or instructor's consent.

650—Philosophy of Sciece in Nursing (3). Telecommunications from UMKC to Columbia and St. Louis. Prerequisite: PhD nursing students or permission of instructor.

670—Qualitative Research (3). Telecommunications from UMKC to Columbia and St. Louis. Prerequisite: PhD nursing students or permission of instructor.

Nutritional Sciences

College of Human Environmental Sciences
Nutritional Sciences Office
217 Gwynn Hall
(573) 882-4526
Fax: [573] 882-0185
E-mail: sunder@missouri.edu
Dietetics Office
318 Clark Hall
(573) 882-4136
Fax: [573] 884-4885

FACULTY

R. Sunde, chair, professor.
R. MacDonald, director of undergraduate education, associate professor.
***K. Fritsche,** director of graduate education.
C. Peterson, director of the coordinated program in dietetics.
L. Hillman, professor.
L. Hoover, professor.
T. Thomas, professor.
G. Weisman, professor.
R. Dowdy, associate professor.
D. Eide, associate professor.
D. Brigham, assistant professor.
P. Landhuis, assistant professor.
C. Peterson, assistant professor.
M. Petris, assistant professor.
M. Raedeke, assistant professor.
J. Zhang, adjunct assistant professor.
G. Amick, professor emeritus.
J. Flory, professor emeritus.
M. Flynn, professor emeritus.
E. Hensley, professor emeritus.
R. Lutz, professor emeritus.
M. Mangel, professor emeritus.
A. Moore, professor emeritus.
J. Typpo, professor emeritus.
B. Tuthill, professor emeritus.
C. Weaver, professor emeritus.
T. Kintner, assistant professor emeritus.
M. McDonald, assistant professor emeritus.
**Animal Science and Nutritional Sciences Graduate Program*

DEGREES BS in food science and human nutrition (Human Environmental Sciences), MS and PhD in nutrition, MA and PhD in exercise physiology

DEPARTMENTAL REQUIREMENTS The department of Nutritional Sciences administers the BSHES in food science and human nutrition degree program which offers designated emphasis areas in Medical Dietetics, Nutrition and Fitness, and Nutritional Sciences. Students are encouraged to meet with an advisor to clarify their goals, to decide the best emphasis area for their particular circumstances and to select specific courses to meet the requirements and prerequisites of their specific program. Students must complete all the general education requirements of the college of human environmental sciences.

These offices also administer the Nutritional Sciences Graduate Program, which resides in the colleges of Human Environmental Sciences and Agriculture, Food and Natural Resources, and which offers MS and PhD degrees in Nutrition. And these offices also administer the Exercise Physiology Graduate Program which resides in the College of Human Environmental Sciences and which offers MA and PhD degrees in Exercise Physiology.

MEDICAL DIETETICS The Coordinated Program in Dietetics combines academic course work with supervised practice in healthcare settings. Graduates are eligible to write the Registration Examination for Dietitians, which is required to obtain the RD (Registered Dietitian) credential. The program is accredited by the Commission on Accreditation/Approval for Dietetics Education of the American Dietetic Association.

Enrollment is limited. To apply, students must have completed (or be enrolled in) prerequisite courses and have a minimum 2.5 GPA. Application deadline is the second Monday in February each year. Application materials and selection criteria are available from Program Director, Dr. Catherine Peterson, 318 Clark Hall.

Biological and Physical Sciences (24)
Biochemistry (3)
General Biology and Laboratory (5)
General Chemistry and Laboratory (6)
Organic Chemistry and Laboratory (5)
Physiology (5)
English and Communications (6)
Exposition and Argumentation (3)
Humanities and Fine Arts (9)
Introduction to Speech Communication (3)
Math and Statistics (6)
College Algebra (3)

Statistics (3)
Social and Behavioral Sciences (12)
Introduction to Psychology (3)
Introduction to Sociology (3)
Economics (3)
History or Political Science (3)
Food Science and Human Nutrition
FS 111: Principles of Food Preparation (2)
FS 121: Sciences of Food Preparation (5)
FS 172: Elements of Food Microbiology (3)
NS 228: Principles of Food Systems Management (3)
NS 234: Human Nutrition I (3)
NS 236: Fundamentals of Nutrition Care (5)
NS 237: Clinical Nutrition (4)
NS 239: Nutrition Education in the Community (3)
NS 245: Life Cycle Nutrition (3)
NS 303: Nutrition Capstone Seminar (1)
NS 311: Investigations of Food Properties (3)
NS 324: Food Production in Food Service Systems (5)
NS 328: Management of Food Systems (3)
NS 334: Human Nutrition II Lecture (3)
NS 338: Advanced Clinical Nutrition (6)
NS 339: Issues in Dietetic Practice (2)
NS 340: Practice of Dietetics (10)
Additional Requirements (5)
***Due to changes in accreditation standards, curriculum changes will occur during this catalog period. Check with dietetics advisors for revised program requirements.*

NUTRITION AND FITNESS Graduates of this program will be prepared for employment in the fitness and health promotion area or graduate studies in exercise science. This is a rapidly expanding area with opportunities in corporate and commercial industries, government and nonprofit sectors. Typical employment responsibilities might include fitness assessment, nutrition education, health promotion, exercise supervision and program administration.

For additional information see director of undergraduate education Dr. Ruth MacDonald, or the program office, 217 Gwynn Hall.
Biological and Physical Sciences (28)
General Biology and Laboratory (5)
General Chemistry and Laboratory (5)
Organic Chemistry and Laboratory (5)
Biochemistry (3)
Physiology (5)
Anatomy Lecture and Laboratory (5)
English and Communications (6)
Exposition and Argumentation (3)
Introduction to Speech Communication (3)
Humanities and Fine Arts (9)
Math and Statistics (9)
College Algebra (3)
Statistics (3)
Computer Science (3)
Social and Behavioral Sciences (9)
Must include one course in History or Political Science.
Food Science and Human Nutrition (13)
NS 134: Nutrition and Fitness (3)
NS 234: Human Nutrition I (3)
NS 236: Fundamentals of Nutrition Care (3)
NS 245: Life Cycle Nutrition (3)
NS 303: Nutrition Capstone Seminar (1)
Exercise Physiology (14)
NS 385: Physiology of Exercise (3)
HRP 375: Kinesiology (3)
NS 280: Care and Prevention of Athletic Injuries (2)
NS 336: Human Body Composition and Nutrition (3)
NS 386: Exercise Testing and Prescription (3)
Supporting Area (10)
Choose from selected courses in Curriculum and Instruction, Educational and Counseling Psychology, Nutritional Sciences, Human Development and Family Studies, Psychology or Sociology
Electives (16-24 hours) chosen to meet college requirements and career objectives
Opportunities for internships are available and highly recommended.

NUTRITIONAL SCIENCES This program of study provides a strong foundation in science with a focus on human nutrition. Graduates will be prepared for advanced study in human nutrition, medicine, dentistry or other health-related careers. This program is a particularly excellent choice for pre-medicine students with an interest in family practice or rural medicine.

For additional information see director of undergraduate education Dr. Ruth MacDonald, or the program office, 217 Gwynn Hall.
Biological and Physical Sciences (25)
General Biology and Laboratory (5)
General Chemistry and Laboratory (6)
Organic Chemistry and Laboratory (6)
Physics (8)
English and Communications (6)
Exposition and Argumentation (3)
Introduction to Speech Communication (3)
Humanities and Fine Arts (9)
Math and Statistics (15)
College Algebra (3)
Calculus (10)
Statistics (3)
Computer Science (3)
Social and Behavioral Sciences (9)
Political Science or History (3)
Core Curriculum (30)
NS 234: Human Nutrition (3)
NS 245: Life Cycle Nutrition (3)
NS 303: Capstone Seminar (1)
NS 333: Human Nutrition II lab (2)
NS 334: Human Nutrition II lecture (3)
BIOCH 270: Biochemistry (3)
BIOCH 272: Biochemistry (3)
BIOSC 202: General Genetics (4)
BIOSC 203: Intro Cell Biology (3)
PHYS 201: Physiology (5) **or**
BIOSC 270: Animal Physiol (5)
Supporting Areas (5)
Choose from selected courses in Biochemistry, Chemistry, Nutritional Sciences or Molecular Microbiology and Immunology.
Additional courses may be required to meet college requirements or career objectives. On-campus research internships are available and highly recommended.

MINOR IN NUTRITIONAL SCIENCES Intended for students majoring in Biological Sciences, Biochemistry, Health and Exercise Sciences or related fields. A minor must include NS 234 Human Nutrition I (3) plus a minimum of 12 hr selected from the list of approved nutrition courses numbered 100 or above.
NS236: Fundamentals of Nutrition Care (3)
NS237: Clinical Nutrition (3)
NS238: Diet Therapy for Health Professionals (3)
NS239: Nutrition Education in the Community (2)
NS 245: Life Cycle Nutrition (3)
NS246: Eating Disorders (2)
NS 333: Human Nutrition II Laboratory (1)
NS 334: Human Nutrition II Lecture (3)
NS336: Body Composition and Nutrition (3)
NS338: Adv. Clinical Nutr. (3)

COURSES

34—Nutrition, Current Concepts and Controversies (3). Basic nutrition principles and current controversies are presented. Emphasis on role of nutrition in maintaining health as well as exploring the scientific validity of popular nutrition beliefs. No credit if taken after NS 234.

131—Basic Concepts of World Nutrition (3). Transdisciplinary approach to nutrition, considering anthropological, physiological, geographical, socioeconomic and psychological elements in world nutrition.

134—Nutrition and Fitness (3). The utilization and requirement of nutrients for physical activity and athletic performance. Letter grading. f,w.

180—Psychology of Fitness and Sport (2). An introduction to psychological concepts relating to physical activity, sport, and fitness; relationships between movement forms and socialization processes.

199—Seminar in Professional Development (1). Readings and discussion related to professional development for the industry. Prerequisites: senior or second semester junior. f,w.

200—Problems (cr. arr.). Supervised study in nutritional sciences.

228—Principles of Food Systems Management (3-4). Organizational structure and relationships; policy making and implementation; budgeting and cost control; menu as a management tool; sanitation and safety; food preparation; and food delivery systems. Prerequisite: FS 121.

234—Human Nutrition I (3). Basic concepts of normal nutrition related to physiological/chemical processes; changing nutrient needs during human life cycle, emphasis on adult; some social/psychological influences on dietary habits. Prerequisites: Organic Chemistry, Physiology or instructor's consent.

236—Fundamentals of Nutrition Care (3-5). Introduction to nutrition assessment process. Use of dietary and anthropometric parameters to establish nutritional needs of individual at risk. Prerequisites: 234, 245 (may be taken concurrently), Psychology I or instructor's consent.

237—Clinical Nutrition (2-4). Continuation of study of nutritional assessment and care process. Development of nutritional care plans for hospitalized patients with a variety of problems related to nutritional status. Prerequisites: 236, Biochemistry or instructor's consent.

238—Diet Therapy for Health Professionals (3). Principles underlying normal nutrition and diet for health and disease. Prerequisites: instructor's consent.

239—Nutrition Education in the Community (2-3). Concepts and techniques used in assessment of nutrition education needs of community groups and development of educational programs to meet those needs. Prerequisites: 245, 236, Sociology or instructor's consent.

245—Life Cycle Nutrition (3). An examination of factors influencing nutritional needs during periods of growth, development and aging and the application of these factors to feeding individuals and groups. Prerequisites: 234 or instructor's consent.

246—Eating Disorders (2). Definition, etiology, treatment, and research related to eating disorders: anoriexia nervosa,

bulimia nervosa and binge eating disorder/obesity. Prerequisites: FSHN 34 or higher level nutrition course. Graded on A/F basis only. f.

280—Prevention and Care of Athletic Injury (2). Theory, practice in prevention, emergency care, rehabilitation of injuries encountered in vigorous games. Prerequisite: Anatomy.

300—Problems (cr. arr.). Advanced problems in a selected field of nutritional sciences.

301—Topics in Nutritional Sciences (cr. arr.). Instruction in specific subject matter areas in the field of food science and nutrition.

302—Monogastric Nutrition (3). (same as Animal Science and Nutrition 302). Principles of nutrition, feed formulation and recent research in poultry feeding. Prerequisite: Animal Science 202 and Biochemistry 193. Letter grading only. f.

303—Nutrition Capstone Seminar (1). Integration of research literature with knowledge from previous coursework. Examination of research articles in major. Presentation or research results in a formal setting. Prerequisite: senior standing or instructor's permission.

324—Food Production in Foodservice Systems (3-5). A lecture/lab/practicum designed to expose students to concepts of quality food production, evaluation of product and resources and food microbiology application in lab/practicum. Prerequisites: 228 or instructor's consent.

328—Management of Food Systems (3). Interactive discussion of current issues in foodservice management. Independent study of varous foodservice facilities using principles of management. Prerequisites: 228, 324.

333—Human Nutrition II Laboratory (2). A techniques course in nutrition, usually taken concurrently with 334. Prerequisites: 234, Biochemistry and instructor's consent.

334—Human Nutrition II Lecture (3). Physiological and biochemical aspects of nutrition; functions of methods of measuring nutritional status; various aspects of applied nutrition. Continuation of 234. Prerequisites: 234, Biochemistry or instructor's consent.

336—Human Body Composition and Nutrition (3). Basic concepts of human body composition related alternative models, measurement techniques, and nutritional, physiological, and life-style factors. Prerequisite: 234. Graded on A/F basis only. w.

338—Advanced Clinical Nutrition (3-6). Continuation of study of nutritional care for chronic and acute medical and surgical problems: role of diet in the etiology of disease and diet modifications in overt disease conditions. Prerequisites: 334 or equivalent.

339—Issues in Dietetic Practice (2). Lectures and discussions focus on issues and trends in dietetics. Discussions are used to enhance the development of personal and professional attitudes relevant to practice. Prerequisites: 338 or instructor's consent.

340—Practice of Dietetics (10). Application of nutrition care and management skills in supervised practice settings. Prerequisites: 328, 338, 339 concurrently (open only to CP Dietetics majors)

350—Readings (cr. arr.). Prerequisites: 8 hours of course work in field of subject and instructor's consent.

380—Kinesiology (3). Study of the relationships of physical laws, mechanical principles, and structural parameters to the analysis of human motion, with emphasis on application to daily activities, sport/athletic performance, and developmental exercise. Prerequisite: Anatomy 201.

381—Advanced Athletic Training (3). Advanced study in areas of prevention, evaluation, care, and treatment and rehabilitation of athletic injuries at high school and college level. Letter grading. Prerequisite: 280.

385—Physiology of Exercise (3). Effects of exercise on the human organism; physiologic capacity and limitation for activity; role of exercise in health and fitness. Prerequisite: Physiology 201 (Anatomy 201 recommended.

386—Exercise Prescription (3). Course investigates theory and methods of testing and prescribing exercise for circulatory fitness, body composition, muscle strength, joint and muscle ranges in motion, and posture. Prerequisites: 385 and HRP 375.

390—Field Training (cr. arr.). Prerequisites: junior or senior standing and instructor's consent.

391—Internship in Nutritional Sciences (1-6). Combines study, observation and employment in an area of food science and nutrition. Written reports, faculty evaluation. Prerequisites: 90 hours including 3 courses in department and instructor's consent.

400—Problems (cr. arr.). Individual studies include minor research problems.

401—Topics in Nutritional Sciences (cr. arr.). Specialized topics in the area of food science and nutrition. Prerequisites: instructor's consent and graduate standing.

403—Trace Elements and Macro Minerals (3). (same as Nutrition and Animal Science 403). Focuses on nutritional needs for minerals by humans, livestock and experimental animals. Emphasis given to nutrients of interest to class. Prerequisites: Biochemistry 270-272 and 300-level nutrition course. Letter grading only. w.

410—Seminar (1). Provides students with opportunities for development in depth of advanced aspects of nutritional sciences through reviews of research in progress and of current scientific publications. f,w.

415—Readings (cr. arr.). Prerequisites: 15 hours course work in field of subject and instructor's consent.

428—Advanced Food Systems Management (3). An intensive study of the application of current management concepts and management science techniques to financial and professional accountability in food systems. Prerequisites: graduate student in Food Systems Management or instructor's consent.

432—Nutritional Integration of Metabolism (3). Discusses mammalian metabolism emphasizing relationships between nutrient intake and biochemical and physiological events occurring in cell, organ and whole organism. Prerequisites: 334 and Advanced Biochemistry.

433—Methods of Nutrition Research (3). Work in various methods and techniques used in nutrition research. Prerequisite: Biochemistry 270 or equivalent.

434—Nutrition in Human Health (3). (same as Nutrition 434). Nutritional aspects of maintaining human health with emphasis on chronic disease prevention. Grades based on classroom particpation and four exams. Prerequisites: Biochemistry 270 and 272; 300-level nutrition course.

436—Nutritional Biochemistry of Carbohydrates I (3). (same as Nutrition, Biochemistry, and Animal Science 436). Provides a critical understanding of current developments in lipid metabolism in animals and humans, particularly as it relates to nutrition and health. Prerequisite: Biochemistry 270 and 272; at least 1-300 level nutrition course.

438—Nutrient Regulation of Gene Expression (3). (same as Nutrition 438). Current concepts with in-depth coverage of several minerals that illustrate themes in molecular mineral nutrition. Based entirely on research literature and taught in a tutorial format. Prerequisites: Biochemistry 270 and 272; 300-level nutition course.

439—Molecular Biology of Mineral Nutrition (3). (same as Nutrition 439). Current concepts of metal ion transport, intracellular metal trafficking and metal-dependent regulation of gene expression. Based entirely on research literature and taught in a tutorial format. Prerequisites: Biochemsitry 270 and 272; 300-level nutrition course.

450—Research (cr. arr.). Original investigations, usually in connection with one of the research projects of Agricultural Experiment Station. Written report required.

461—Nutritional Endocrinology (2). The overall objective is to understand the relationships between nutrient requirements, utilization and transport and hormonal factors in normal and disease states. Prerequisites: Biochem 270, 272 and 274, nutrition or instructor approval. f., even years.

481—Sports Conditioning (3). Course covers scientific aspects of preparing athletes for sports competition. Topics range from those related to youth sports to those related to elite performance. Major topics include muscular function, nutrition, and endurance and sprint training. Prerequisite: exercise physiology.

484—Cardiovascular Health and Fitness (3). Physiology underlying best methods for obtaining and maintaining cardiovascular health and fitness. Includes exercise and weight control, plasma lipids, energy metabolism, cardiovascular dynamics, and recent research findings.

485—Advanced Exercise Physiology (3). Lectures, laboratory experiences, and readings in current literature to provide reasonable depth in selected areas of physiology as applied to activity and health. Prerequisites: H385; some Chemistry suggested.

487—Exercise Metabolism (3). Review of major metabolic pathways and the effect of exercise upon them. Special topics include indirect calorimetry, EPOC, anaerobic threshold; weight control, ergogenic aids, and exercise nutrition. Prerequisites: H385 and chemistry (suggested). w.

490—Research (cr. arr.). Original investigation of advanced nature, leading to dissertation. Graded on a S/U basis only.

Nutritional Sciences Graduate Program

College of Human Environmental Sciences
College of Agriculture, Food and Natural Resources
217 Gwynn Hall (573) 882-4526
Fax: [573] 882=0185
e-mail: sunder@missouri.edu

FACULTY

Roger A. Sunde, chair, professor of nutritional sciences/biochemistry, Food for the 21st Century Nutrition Cluster Leader, PhD, University of Wisconsin-Madison. Selenium deficiency and excess as a model for nutrient regulation of gene expression; molecular mechanism of selenium regulation.

Kevin L. Fritsche, director of graduate studies, associate professor of animal sciences, PhD, University of Illinois at Urbana-Champaign. Effect of dietary fats on immune functions and vitamin E requirements.

Laura S. Hillman, professor of child health, MD, Yale University. Calcium metabolism in the premature and newborn infant.

Grace Y. Sun, professor of biochemistry, PhD, Oregon State University. Effect of alcoholism on a phospholipid-mediated cell signaling.

Trygve L. Veum, professor of animal sciences, PhD, Cornell University. Amino acid and mineral availability and nutrition for lean growth in swine.

Gary A. Weisman, professor of biochemistry/ nutritional sciences, PhD, University of Nebraska-Lincoln. Role of nucleotide receptors in the regulation of cardiovascular, neuronal and neoplastic cell functions.

Richard P. Dowdy, associate dean of human environmental sciences and associate professor, Agricultural Experiment Station/nutritional sciences, PhD, North Carolina State University-Raleigh. Influence of aging on trace and macro element nutrition.

David J. Eide, associate professor of nutritional sciences/biochemistry, PhD, University of

Wisconsin-Madison. The molecular biology of metal ion transport proteins and the regulation of metal ion homeostasis in eukaryotic cells.

David R. Ledoux, associate professor of animal sciences, PhD, University of Florida. Mineral and vitamin availability and requirements.

Ruth S. MacDonald, associate professor of nutritional sciences/biochemistry, PhD, University of Minnesota. Role of nutrition on membrane receptors as a model for intestinal disease.

Dale E. Brigham, assistant professor of nutritional sciences, PhD, Pennsylvania State University. Interactions of exercise and nutrients; effects of iron deficiency and excess.

Catherine A. Peterson, assistant professor of nutritional sciences, PhD, University of Illinois at Urbana-Champaign. Total parenteral nutrition; effects of growth factors and lipid emulsions on gut atrophy and immune function.

Michael J. Petris, assistant professor of nutritional sciences and of biochemistry, PhD, University of Melbourne, Australia. Regulation of copper transport and copper-transporting P-type ATPases in eukaryotic cells and in prokaryotic models.

DEGREES: MS and PhD in nutritional sciences

The Nutritional Sciences Graduate Program prepares students for professional careers in academic institutions, industry and government.

Nutritional Sciences at the University of Missouri-Columbia is an interdisciplinary group comprised of the Nutritional Sciences Graduate Program (NSGP), departmental degree programs, and the Food for the 21st Century (F21C) Nutritional Sciences Cluster. The NSGP coordinates the core graduate nutrition curriculum and offers MS and PhD degrees in nutritional sciences awarded through the Graduate School. In addition, MS and PhD degrees in animal sciences or biochemistry are offered through the respective departments to students studying nutrition. The F21C Nutritional Sciences Cluster is an eminence research program consisting of more than 20 faculty members from eight departments in the colleges of Agriculture, Food and Natural Resources, Arts and Science, Human Environmental Sciences, and Medicine, as well as the Research Reactor Center. This rich environment offers a wide range of interdisciplinary research opportunities for the degree candidate. Entering students are expected to have undergraduate training in chemistry and biology, including a two-semester course in biochemistry and an upper-level nutrition course. Some prerequisites can be met during the first year of graduate study.

MASTER OF SCIENCE DEGREE: The master of science degree is awarded in part for the completion of a thesis. Entrance requirements are those stipulated for the PhD. The minimum department course requirements for the master of science degree are six hours of intermediate biochemistry (i.e., Biochemistry 270 and 272), three of the five core nutritional sciences course (Nutrition 431, 434, 436, 438 and 439), two hours of an experimental techniques course, two hours of seminar and a graduate level course in statistics. A total of 30 hours of credit are required, of which 15 credits must be at the 400 level. Other requirements include a thesis based upon original research, an oral examination and a public seminar based on thesis material. A student is expected to complete an MS degree within a 24-month period.

DOCTORAL DEGREE: Requirements for the PhD degree in nutrition include a mastery of the broad fundamentals of metabolic integration, lipid and mineral biochemistry, signal transduction, and regulation of gene expression, as well as the demonstrated ability to conduct independent, innovative research. Doctoral students must complete the listed requirements for the MS degree in addition to one more core nutritional sciences course (all PhD candidates must take Nutrition 434), four more hours of seminar and nine additional hours of graduate course work in a specific emphasis area. PhD students must take a uniform written comprehensive exam, based on course work, research experience and ability to keep current with the latest trends in nutritional sciences, after completion of all required core courses. Students are admitted to full candidacy for the PhD upon passing the oral comprehensive examination administered by the student's doctoral committee at least seven months before the final defense of the dissertation. The exam is based on an original grant proposal written by the student on the student's area of research, and the oral exam is a presentation and questioning before the student's doctoral committee that is based on, but not limited to, the original grant proposal.

Research opportunities include a broad range of approaches to the study of nutrition, including whole-animal models, cultured-cell models, enzymology and protein characterization, radioisotope tracer methodology, lipid metabolism, receptor methodology and human nutrition. There is particular strength in nutritional biochemistry of macro and trace elements, and in lipids, membranes and signal transduction; this group is increasingly emphasizing application of molecular biology techniques to the study of nutrition.

RESEARCH FACILITIES: The research labs of the nutritional sciences faculty are housed in modern facilities in Eckles Hall, Gwynn Hall, the Animal Sciences Research Center, and the School of Medicine. The F21C Nutritional Sciences Cluster funds a Core Cell Culture facility in Eckles Hall, which provides equipment, supplies and technical support to help researchers readily use cultured-cell models.

FINANCIAL AID: Graduate assistantships are available through the NSGP, and from individual departments. In addition, outstanding students can apply for F21C Nutritional Sciences Cluster fellowships that provide $15,000 per calendar year, plus tuition and fees. Other sources (University fellowships, molecular biology program, and minority recruiting) award assistantships; students also are sponsored by individual faculty members.

APPLYING: Applications should be submitted as early as possible (usually by March 1) for fall admission. While spring admissions are granted, assistantship support is usually more readily available for fall admission. Applicants must have an average of B or better in science (chemistry, physics, mathematics and biology) from an accredited institution and must provide scores on the General Test of the Graduate Record Examinations with scores above the 50th percentile in at least two out of the three sections of the exam. Minimum TOEFL scores of 600 are required for international students.

For additional information write or call the Director of Graduate Education, 217 Gwynn Hall, Columbia, MO 65211, (573) 882-4526, Fax [573] 882=0185, or the Nutritional Sciences web site: http://www.missouri.edu/~nutsci/.

COURSES
NUTRITION

234—Human Nutrition I (3). Basic concepts of normal nutrition related to physiological/ chemical processes; changing nutrient needs during human life cycle, emphasis on adult; some social/psychological influences on dietary habits. Prerequisites: Organic Chemistry, Physiology or instructor's consent.

300—Problems (1-99.9). Advanced problems in a selected field of nutritional sciences.

301—Topics in Nutritional Sciences (1-99.9). Instruction in specific subject matter areas in the field of nutrition.

302—Monogastric Nutrition (3). (same as Animal Science and Food Science and Human Nutrition 302). Principles of nutrition, feed formulation and recent research in poultry feeding. Prerequisites: Animal Science 202 and Biochemistry 193. Letter grading only. f.

303—Nutrition Capstone Seminar (1). Integration of research literature with knowledge from previous coursework. Examination of research articles in major. Presentation or research results in a formal setting. Prerequisite: senior standing of instructor's permission.

400—Problems (1-99.9). Individual studies include a minor research problems.

402—Advanced Nonruminant Nutrition (3). (same as Animal Science 402). w.

403—Trace Elements and Macro Minerals (3). (same as Nutrition and Animal Science 403). Focuses on nutritional needs for minerals by humans, livestock and experimental animals. Emphasis given to nutrients of interest to class. Prerequisites: Biochemistry 270-272 and 300-level nutrition course. Letter grading only. w.

410—Seminar (1). f.

415—Readings (1). Readings in current nutrition research. Prerequisite: graduate standing and approval of faculty advisor. Offered on a S/U basis only.

418—Topics (1-99.9). Selected current topics in field of interest.

431—Nutritional Biochemistry of Lipids (3). Nutritional regulation of lipid metabolism. Emphasis on integrating information and interpreting current research data. Prerequisites: Biochemistry 270 and 272; 300-level nutrition course.

432—Nutritional Integration of Metabolism (3). Discusses mammalian metabolism emphasizing relationships between nutrient intake and biochemical and physiological events occurring in cell, organ and whole organism. Prerequisites: 334 and Advanced Biochemistry.

433—Methods of Nutrition Research (3). Work in various methods and techniques used in nutrition research. Prerequisite: Biochemistry 270 or equivalent.

434—Nutrition in Human Health (3). Nutritional aspects of maintaining human health with emphasis on chronic disease prevention. Grades based on classroom participation and four exams. Prerequisites: Biochemistry 270 and 272; 300-level nutrition course.

436—Nutritional Biochemistry of Carbohydrates (3). Nutritional regulation of carbohydrate metabolism. Emphasis on integrating information and interpreting current research data. Prerequisites: Biochemistry 270 and 272; 300-

level nutrition course.

438—Nutrient Regulation of Gene Expression (3). Current concepts with in-depth coverage of several minerals that illustrate themes in molecular mineral nutrition. Based entirely on research literature and taught in a tutorial format. Prerequisites: Biochemistry 270 and 272; 300-level nutrition course.

439—Molecular Biology of Mineral Nutrition (3). Current concepts of metal ion transport, intracellular metal trafficking and metal-dependent regulation of gene expression. Based entirely on research literature and taught in a tutorial format. Prerequisites: Biochemistry 270 and 272; 300-level nutrition course.

450—Investigations in Experimental Nutrition (1-6). Written report required. f,w,s.

461—Nutritional Endocrinology (2). (NS 461) The overall objective is to understand the relationships between nutrient requirements, utilization and transport and hormonal factors in normal and disease states. Prerequisites: Biochem 270, 272 and 274, nutrition or instructor approval. f., even years.

465—Amino Acid and Protein Metabolism (2). (same as Biochemistry 465).

490—Research (1-99.9). Investigation in any area of experimental nutrition. Thesis required. Graded on a S/U basis only. f,w,s.

Occupational Therapy

School of Health Related Professions
126 Lewis Hall (573) 882-3988

The School of Health Related Professions does not offer a graduate degree in occupational therapy, but some courses are available for graduate credit.

205—Loss and Disability (3). Reactions to illness, disability, and death. Identifies the roles of caregivers and patients. Addresses body image, self concept, and adjustment problems met in life when terminal illness or disability is present.

220OT—Creative Media I (1). Laboratory course for developing competency in creative media. Emphasis on developing competencies in woodworking, activity analysis and adaptation, and the value of creativity in wellness. Graded on a S/U basis only

221OT—Creative Media II (1). Laboratory course for developing competency in creative media. Emphasis on arts and crafts, activity analysis and adaptation, and the value of creativity in wellness. Graded on a S/U basis only.

222OT—Creative Media III (1). Laboratory course for developing competency in creative media. Emphasis on arts and crafts, activity analysis and adaptation, and the value of creativity in wellness. Graded on a S/U basis only.

223OT—Adaptive Media (1). Laboratory course in adapting media and developing assistive technology. Activty analysis emphasized. Taken concurrently with 322OT. Graded on a S/U basis only.

225OT—Professional Perspectives (2). Understanding and directing personal and professional communication through experiential activities. Includes formation of a professional and therapeutic relationships, and leadership development. Also concepts of Dyad and group dynamics will be presented.

233OT—Clinical Conditions in Pediatric Occupational Therapy (1). A systems approach to etiology, physiology, clinical manifestations, and clinical management of diseases and conditions and developmental deviations of pediatric populations relevant to occupational therapy practice.

234OT—Clinical Pathophysiology II (3). A system approach to normal physiology, disease and clinical manifestations of disease.

235OT—Occupational Performance (4). The course examines occupation within the health-wellness continuum. Activity analysis and adaptation are performed in laboratory and community experiences. Seminar topics include self awareness, stress management, examination of personal values and human diversity.

240OT—Human Motion and Activity (3). Analysis of movement within the framework of human occupation. Assessment of musculoskeletal function. Participation in activity adaptation and analysis of performance components. Introductory motor control concepts.

243OT—Applied Neurphysiology for Allied Health Students (3). (same as Communicative Science and Disorders 243 and Physical Therapy 243PT). Principles of basic neurophysiology, emphasizing correlation of structure and function of the nervous system.

245OT—Developmental Framework (3). Lecture and Laboratory course designed to provide the occupational therapy student with an understanding of the process of normal development and prepare the student to administer common developmental assessments for infants and young children.

270—Clinical Kinesiology (3). Functional anatomy and biomechanics in normal and abnormal conditions of extremities, back, neck and thorax. Dynamics of human motion and motor skills. Muscle testing and goniometry lab.

280OT—Fieldwork Level I-Disability in Context (2). Community experiences for observational, interviewing, assesssment, and relational skills with persons experiencing cross disabilities throughout the lifespan. Overview of professional and therapeutic relationships. Lecture, seminar weekly.

281OT—Fieldwork Level I - Lifespan Developmental Processes (2). Fieldwork developing clinical observational skills of pre-school children and older adults in supported living environments. Emphasis on data collecting and synthesis, developing therapeutic relationships, planning and implementing developmental activities. Lecture, seminar weekly.

314OT—Occupational Therapy Practice in Health Care Systems (3). Examines current practice from historical and philosophical perspective. Analyzes influence of environment in delivering health care services. Examines issues and trends in practice from professional, legal, political, ethical viewpoints.

315OT—Organization & Administration (3). Organizational structure of occupational therapy service programs in various types of community and institutional practice settings. Interdepartmental and intradepartmental relationships, management and supervision, standards, regulations, and ethical guidelines emphasized.

316OT—Programming and Evaluation Methods in Occupational Therapy (3). Research methodology and efficacy studies emphasizing development of knowledge and skills in critiquing research and professional literature pertinent to occupational therapy. Scholarly writing and application of research results to practice settings.

320OT—Rehabilitiation Priniciples in Occupational Performance (4). Analysis of major disability areas from an occupational perspective. Administration and interpretation of assessments and application of treatment theories and approaches for deficits in movement, sensation, cognition and perception.

322OT—Rehabilitation Priniciples in Occupational Performance II (3). Analysis of major disability areas from an occupational perspective. Administration and interpretation of assessments and application of treatment theories and approaches for deficits in movement, sensation, cognition and perception.

331—Psychopathology (2). Focus on the major theories in etiology of psychosocial dysfunction as applicable to occupational therapy; review of classification and characteristics of pathological syndromes.

331OT—Psychopathology (3). Lectures designed to give better understandings of etiology, symptomatology, prognosis and medical treatment of psychiatric disorders as necessary to the practice of occupational therapy.

332OT—Psychosocial Dysfunction in Practice (3). Theories and techniques of occupational therapy in treatment of psychosocial dysfunction. Emphasizes occupational performance in evaluation methods, treatment techniques, program planning, therapeutic use of self, group leadership in the integration of mental health concepts.

345OT—Neuromotor and Sensory Processing Bases of Function (2-3). Examines neuromotor and sensory processing bases of function in relation to children. Emphasizes occupational therapy process through application of evaluation methods, intervention techniques in pediatric practice.

350OT—Clinical Cases in Occupational Therapy (2). Synthesis of occupational therapy approaches to clinical cases across age-span in primary practice areas. Identifying community health needs and health promotion/prevention interventions. Clinical reasoning, life-long learning, self-evaluation emphasized utilizing case methodology.

375OT—Human Kinesiology (3). (same as Physical Therapy 375PT and Health Related Profession 375). Study of principles of physical laws, biomechanics and anatomic structure relative to human movement. Application through analysis of daily functional performance, exercise and sport. Prerequisite: Human Anatomy. f.

380OT—Fieldwork Level I-Foundations of Health Care Delivery (1). Clinical experiences in occupational therapy practice. Integration and application of theory and techniques in a treatment setting. Emphasis on clinical reasoning and documentation. Lecture, seminiar weekly.

381OT—Fieldwork Level I-Rehabilitation (1). Clinical experiences in rehabilitation practice settings. Emphasis on integration and application of human occupation theory and treatment techniques. Explores roles and functions of occupational therapy in rehabilitation. Promotion of professional values. Lecture, seminar weekly.

382OT—Fieldwork Level I-Children (1). Clinical experiences in practice settings focused on children. Emphasis on integration and application of human occupation theory and treatment techniques. Explores roles and functions of pediatric occupational therapy. Promotion of professional values. Lecture, seminar weekly.

383OT—Fieldwork Level I-Mental Health (1). Clinical experiences in mental health settings. Emphasis on integration and application of human occupation theory and treatment techniques. Explores mental health occupational therapy roles and functions. Promotion of professional values. Lecture, seminar weekly.

390OT—Fieldwork Level II-Foundations of Rehabilitation (3-9). Clinical practicum in rehabilitation setting for application of rehabilitation principles and techniques. Emphasis on connection of theory of human occupation to practice in biopsychosocial model and collaborative professional relationships. Graded on a S/U basis only.

395OT—Fieldwork Level II-Transition to Independence (3-9). Clinical practicum in specialized or community based settings. Integrates occupational therapy concepts and interventions. Emphasizes critical analysis and application of human occupation theory in biopsychosocial model and collaborative professional relations. Graded on a S/U basis only.

Parks, Recreation and Tourism

School of Natural Resources
College of Agriculture, Food and Natural Resources
105 Anheuser-Busch Natural Resources Building (573) 882-7086
Fax [573] 882=9526

FACULTY

C. Randal Vessell, department chair, director of graduate studies, associate professor, PhD, University of Iowa.
Glenn A. Gillespie, professor emeritus, PhD, University of Missouri-Columbia.
Keith B. Roys, professor emeritus, PhD, University of Illinois.
Hardeep S. Bhullar, associate professor, PhD, University of Georgia.
Jaclyn Card, associate professor, PhD, University of Utah.
Michael E. Crawford, associate professor, Re.D., Indiana University.
Gerald L. Hitzhusen, associate professor, MS, University of Missouri-Columbia.
Steven C. Lamphear, associate professor emeritus, PhD, University of Georgia.
Anthony A. Menditto, adjunct associate professor, PhD, University of Houston.
Glenn D. Weaver, associate professor emeritus, MS, University of Missouri-Columbia.
R. Neil Moisey, assistant professor, PhD, University of Montana.
David R. Vaught, director of internships, resident instructor, MS, University of Missouri-Columbia.

DEGREE: MS in parks, recreation and tourism

The purpose of the graduate degree is to prepare the candidate for decision-making positions beyond the entry-level practitioner. The degree aims to enhance skills, understanding, practice and knowledge of professional service delivery, while sustaining a commitment to scholarship and investigation as foundations of professional excellence.

MASTER'S DEGREE: To be accepted as a candidate for the degree, an applicant should possess an undergraduate degree and academic performance that displays a breadth and depth of university education in social, behavioral, mathematical and natural science, and major-specific course work. While the degree structure is based on a foundation of an accredited baccalaureate degree in the field, applicants whose undergraduate work is outside the major are not prohibited from enrollment. The degree can be pursued successfully with manageable deficiency course work requirements in most cases. The GRE general test is required for admission into the program.

The master's degree can be successfully attained via two options—thesis option or non-thesis option. The thesis option requires a minimum of 30 credit hours, which includes: a minimum of 15 hours at the 400 level; a minimum of 12 hours of theory-based contact courses within the major; and an independent scholarship effort within the thesis format. The non-thesis option requires a minimum of 39 credit hours, which includes: a minimum of 15 hours at the 400 level; a minimum of 12 hours of theory-based contact courses within the major; and an independent scholarship effort within the project format.

For additional information write or call the Director of Parks, Recreation and Tourism Graduate Studies, 105 Anheuser-Busch Natural Resources Building, Columbia, MO 65211, (573) 882-7086.

COURSES

205—Personnel Management and Leadership in Leisure Services (3). Considers theories and practices of leadership and management in leisure services employment. Topic presentation in relationships, attitudes, supervision, motivation and group functioning. w.

206—Program Development in Leisure Services (3). Fundamental principles and techniques of program development; seasonal, year round, specialty areas and total agency program planning. Prerequisites: a course in human growth and development, 10, 11, 151 or instructor's consent. w.

212—Planning Recreation and Leisure Environments (3). Practical application of basic planning principles and design. Layout and design of various leisure-oriented areas and facilities. Site planning and analysis.

226—Introduction to Leisure & Special Populations (3). Principles, concepts and historical development of recreation and leisure services to specific populations. Explanation of attitudes, issues, practice and barriers related to leisure fulfillment. f.

227—Introduction to Therapeutic Recreation (3). An investigation of therapeutic recreation service delivery models of the 111 and disabled in both institutional and community settings. Particular emphasis will be placed on advanced leadership and therapeutic interactional skills and dynamics. f.

230—Introduction to Parks and Outdoor Recreation Services (3). An overview of parks and outdoor recreation, natural environment, supply-demand-need relationships, interpretative programming, management philosophies/practices will be studied. w.

231—Principles of Interpretive Outdoor Recreation (3). Interpretive principles and techniques employed to communicate values, natural history and cultural features to the recreation user. w.

289—Parks, Recreation and Tourism Internship (12). Supervised professional experience with an approved organization. Course entails weekly reports, case studies, agency evaluations and a special project related to the student's curricular emphasis. Prerequisite: PRT 189, majors only, instructor's consent. f,w,s.

300—Problems (3). cor.

316—Administration of Leisure Services (3). Theoretical foundations of the organization and administration of leisure services in both community and institutional settings. Emphasis on the roles of the administrator. w.

327—Operation of Therapeutic Recreation: Procedures and Principles (3). Theories and principles of leadership and programming as they apply to recreation services for the ill, handicapped, and aged. w.

328—Leisure and Aging (3). Basic understanding of problems/needs of later maturity in relation to recreation. Characteristics/capabilities of aged, program settings, financial support, planning guidelines emphasized. Objectives: provide fundamentals for recreation planning with aged individuals/groups. Offered periodically.

329—Therapeutic Recreation Education/Counseling Techniques (3). Techniques and models of leisure facilitation for use within a variety of clinical, residential and Institutional models. Theories of positive/negative leisure engagement reviewed. f.

330—Therapeutic Recreation Assessment/Evaluation Procedures (3). Reviews accepted clinical protocols for determining a client's physical, emotional, social and cognitive levels of functioning. Competencies in administering, scoring and interpreting multiple tools included. w.

333—Park Management (3). Basic principles, practices and problems involved in managing public park systems. Consideration given to local, district, county, state, federal and foreign park systems. f.

340—Advanced Recreation Land Management (3). (Same as Forestry 340.) Advanced study of problems facing forest recreation managers. Topics include rivers recreation, wilderness management and citizen participation in decision making. Offered periodically.

342—Principles & Practices of Fund Raising/Evaluation for Hum Srv Org (3).

355—Private and Commercial Recreation Principles and Practice (3). Considers principles, practices, influences in public/ private leisure services; influence of tourism/travel on public/private recreation services.

356—Tourism Management (3). Introduction to the scope and scale of the tourism industry. Focus on the industry components, concepts, structures, relationships, and issues with regard to accommodation, transportation, travel, regional development, political system, and the economic, social and environmental effects of tourism. f.

357—Tourism Planning and Development (3). Nature and scope of tourism planning at the local, regional, and national levels; economic social, environmental, and policy considerations. Comparative study of initiating, planning and implementing tourism and the organization of community resources for developing and controlling a tourism industry. Prerequisite: PRT 356. w.

391—Topics in Leisure Studies (1-3). Specialized topics in leisure and leisure delivery systems. Subjects and earnable credit vary semester to semester. Specific content varied depending upon available faculty resources and student needs. Course content announced in advance. Prerequisite: instructor's consent. Offered periodically.

400—Problems (1-6). Independent research on special projects. Prerequisites: Instructor's consent; graduate major. f,w,s.

401—Constructs of Leisure (3). Review analysis and implications of fundamental psycho-social determinants of leisure behavior. Application theories of determinants to existing and proposed leisure service systems. f.

403—Research Methods in Parks, Recreation and Tourism (3). Analysis of basic research methodology. Review and analysis of research work completed in recreation, park and leisure field. Prerequisites: PRT graduate major or instructor's consent. w.

405—Administration in Leisure Service Delivery (3). Review, analysis and synthesis of administrative functions as related to public and private recreation and leisure service enterprises. f.

406—Financial Operations in Leisure Service Delivery (3). Review and critical analysis of financial functions, strategies and methodology a related to public and private recreation and leisure service enterprises. w.

410—Masters Level Graduate Seminar (2). Discussion and critical analysis of contemporary issues on social concerns relating to leisure services. Prerequisites: PR&T graduate major or instructor's consent.

411—Independent Work in Parks, Recreation and Tourism (1-3). Independent research or special projects in parks, recreation and tourism. Prerequisites: instructor's consent. f,w,s.

436—Policy Issues in Outdoors-Resource Based Recreation (3). Course presents issues, concerns and policies dealing with multi-management/planning/operations of outdoor resource based recreation. Such issues as energy, economics, social/ political, pollution and user characteris-

tics will be studied. f.

450—Guided Reading in Parks, Recreation and Tourism (1-3). Selected reading in parks, recreation and tourism identified to fulfill a graduate student's academic needs or specialized interests. Prerequisites: instructor's consent. f,w,s.

480—Research Project (1-3). Individual research on approved project. Involves creativity and scholarly inquire where product does not adhere to the traditional thesis format. Prerequisite: PRT graduate major. Graded on S/U basis only. f,w,s.

481—Internship (1-6). Supervised student practice in recreation, park or related settings under qualified instructor. Prerequisites: PRT graduate major. f,w,s.

490—Thesis Research (1-6). Research leading to thesis in field of recreation. Prerequisite: PRT graduate major. Graded on S/U basis only. f,w,s.

Pathobiology Area Program

201 Connaway Hall (573-882-6550)

The Pathobiology Area Program is designed to prepare students for advanced professional careers in universities and colleges, research institutes, public health, hospital laboratories and industrial research. The broad scope of the program and its organization across departments creates an atmosphere for meaningful interdisciplinary dialogue between graduate students and faculty. Furthermore, it increases availability of advisers, committee members, facilities and equipment for doctoral candidates. A PhD candidate may choose a plan of research to take advantage of a wide range of interests and specialties in pathology and microbiology. Facilities are available that are suitable for advanced research in pathology, microbiology and molecular biology. A wide range of equipment for advanced molecular biological procedures is available. Specialized equipment includes thermal cyclers, electron microscopes, chromatographic equipment, spectrophotometers, ultracentrifuges, electrophoresis apparatuses, liquid scintillation and radioisotope counters, ultramicrotomes and a radiometer blood gas analyzer. Various stipends are available, including teaching and research assistantships and postdoctoral fellowships.

Most of the student's program and examining committees shall be from the area faculty. Under the guidance of a program committee, a course of study is individually designed to fit each student's academic background, experience and objectives. Courses normally suggested for completion include statistics, biochemistry, molecular biology, advanced microbiology and advanced pathology. Courses may be chosen from one or more departments, as decided by the program committee, but shall constitute a definite plan of education for research or scholarly investigation in some particular aspect of microbiology or pathology. The final examination covers mainly the dissertation.

DEGREE REQUIREMENTS: To be accepted into the area program, a student should have completed mathematics through college algebra, 10 hours of chemistry including organic, 10 hours of biology and five hours of physics. The PhD degree requires 72 credit hours of work including a minimum of 15 credits of upper level graduate course work inclusive of research credits. The student must pass a written and oral comprehensive examination in the area of study, and write, present and defend a dissertation which embodies the results of original and significant investigation by the candidate. The master's degree or a professional college degree (MD or DVM) may be accepted for admission instead of the minimal GPA stipulated for admission, if the applicant attained a minimal GPA of 3.0 (A=4.0) in graduate courses. Prospective graduate students must submit GRE general test scores to be considered for admission to the area. A qualifying examination administered may be required for admittance by the doctoral program.

AREAS OF STUDY: Bacteriology; DNA and RNA analysis; electron transport systems in tissues; epidemiology and pathogenesis of avian and mammalian disease (companion animal, food-producing animal and spontaneous disease of laboratory animals); host cell-pathogen relationships; immunology; membrane transport systems; molecular biology; oncology; parasitology; ultrastructure; and virology.

FACULTY

The Ph.D. Area Program in Pathobiology is jointly staffed by faculty from the departments of Biological Sciences (College of Arts and Science), Molecular Microbiology and Immunology (School of Medicine), Pathology (School of Medicine), and Veterinary Pathobiology (College of Veterinary Medicine).

John N. Berg, professor of veterinary pathobiology, DVM, Iowa State University, PhD, University of Missouri-Columbia.

Gerald M. Buening, interim chair and professor of veterinary pathobiology, associate dean for research and postdoctoral studies, DVM, PhD, Purdue University.

Charles W. Caldwell, professor of pathology, MD, PhD, University of Missouri-Columbia.

C. Andrew Carson, professor of veterinary pathobiology, PhD, University of Illinois, VMD, University of Pennsylvania.

Robert M. Corwin, professor of veterinary pathobiology, DVM, Michigan State University, PhD, University of Georgia.

William H. Fales, professor of veterinary pathobiology, PhD, University of Idaho.

Richard A. Finkelstein, professor of medical microbiology, PhD, University of Texas-Austin.

Lela K. Riley, professor of veterinary pathobiology, PhD, University of Kansas.

R. Michael Roberts, curators' professor and professor of biochemistry and animal sciences, PhD, Oxford University, England.

George P. Smith, professor of biological sciences, PhD, Harvard University.

Joseph E. Wagner, curators' professor and professor of veterinary pathobiology, DVM, Iowa State University, MPH, Tulane University, PhD, University of Illinois.

Richard J. Wang, professor of biological sciences, PhD, University of Colorado.

Edward H. Adelstein, associate professor, DVM, MD, MS, University of Missouri-Columbia.

Alex J. Bermudez, associate professor of veterinary pathobiology, DVM, MS, University of Illinois Champaign-Urbana.

Cynthia Besch-Williford, associate professor of veterinary pathobiology, DVM, Louisiana State University, PhD, University of Missouri-Columbia.

Stan W. Casteel, associate professor of veterinary pathobiology, DVM, University of Missouri-Columbia, PhD, Texas A&M University.

D. Mark Estes, associate professor of veterinary pathobiology, PhD, Texas A&M University.

Craig L. Franklin, associate professor of veterinary pathobiology, DVM, PhD, University of Missouri-Columbia.

Theodore J. Green, associate professor of veterinary pathobiology, PhD, The Ohio State University.

Barry C. Holwerda, assistant professor, PhD, University of Saskatchewan.

Reuel R. Hook, Jr., associate professor of veterinary pathobiology, PhD, West Virginia State University.

H.M. (Tim) Huang, associate professor of pathology, PhD, University of California-Davis.

Gary S. Johnson, associate professor of veterinary pathobiology, DVM, University of Minnesota, PhD, Kansas State University.

Gayle C. Johnson, associate professor of veterinary pathobiology, DVM, University of California-Davis, PhD, Washington State University.

Martin L. Katz, research associate professor of ophthalmology, PhD, University of California-Santa Cruz.

John M. Kreeger, associate professor of veterinary pathobiology, DVM, PhD, Louisiana State University.

Margaret A. Miller, associate professor of veterinary pathobiology, DVM, University of Missouri, PhD, Washington State University.

Lanny W. Pace, associate professor of veterinary pathobiology, DVM, Mississippi State University, PhD, Louisiana State University.

Bimal K. Ray, associate professor of veterinary pathobiology, PhD, Calcutta University.

Chadda S. Reddy, associate professor of veterinary biomedical sciences, PhD, Univeristy of Mississippi.

Heide Schatten, associate professor of veterinary pathobiology, director, Electron Microscopy Core Facility, PhD, University of Heidelberg, Germany.

James R. Turk, associate professor of veterinary pathobiology, DVM, University of Missouri-Columbia, PhD, Washington State University.

Gary K. Allen, assistant professor of veterinary pathobiology, DVM, Mississippi State University, PhD University of Missouri-Columbia.

William Jefferson Mitchell, Jr., assistant professor of veterinary pathobiology, DVM, Auburn University, PhD, Cornell University.

Daniel S. Smith, assistant professor of pathology, MD, Indiana University.

Pathology and Anatomical Sciences

School of Medicine
M263 Medical Sciences Building (573) 882-1201

FACULTY

John F. Townsend, chair, professor, MD, University of Missouri-Columbia.

Willis K. Paull, director of graduate studies, professor, PhD, University of Southern California.

Charles W. Caldwell, professor, MD, PhD, University of Missouri-Columbia.
William J. Krause, professor, PhD, University of Missouri-Columbia.
P. Kevin Rudeen, professor, PhD, University of Texas-San Antonio.
Edward H. Adelstein, associate professor, DVM, MD, MS, University of Missouri-Columbia.
Gary B. Dunkerley, associate professor, PhD, University of Texas, Medical Branch.
Finley P. Gibbs, associate professor, PhD, University of Oregon.
Hui-Ming Huang, associate professor, PhD, University of California-Davis.
Alan M. Luger, associate professor, MD, Duke University.
Daniel S. Smith, associate professor, MD, Indiana University.
Linda E. Spollen, associate professor, MD, University of Kansas.
Carol Ward, assistant professor, PhD, Johns Hopkins University.

DEGREE: MS in pathology

INTERDISCIPLINARY AREA DEGREES: PhD through the pathobiology area program

The MS degree is designed primarily to prepare students for teaching in medical technology, supervisory roles in clinical laboratories, and to offer greater in-depth study in pathology concurrent with studies leading to an MD degree.

Admission to candidacy in the master's program is limited to those who hold a baccalaureate degree from an accredited college or university. Each candidate for the master's degree is required to complete a minimum of 30 semester hours, with 15 or more hours at the 400 level, maintenance of a B or better GPA in graduate course work with no more than 12 hours of research, problems or special investigations. Candidates also must satisfactorily complete a thesis. A candidate is expected to demonstrate knowledge of clinical and research techniques and to defend the thesis. Faculty members advise students in the preparation of a program of study. Required courses and those of special interest should complement the student's academic background and career objectives.

INTERDISCIPLINARY AREA OF PATHOLOGY: The Department of Pathology in the School of Medicine with the department of Veterinary Pathobiology in the College of Veterinary Medicine, offers a PhD degree through the Pathobiology Area Program. Resources for research in pathology include standard and special-use equipment in the laboratories. Faculty and staff members provide guidance and practical supervision in clinical and experimental research.

COURSES

200—Basic Pathology (2). Provides nonmedical students with a general understanding of the essential nature of disease, including mechanisms of its development and cause/effect relationships. Prerequisites: 5 hours Biological Science or equivalent and 5 hours Chemistry. or Physiology 201. w.

201—Elementary Anatomy Lecture (3). Basic microscopic and gross human anatomy for Nursing, and Health Related Profession students.

203—Elementary Anatomy Laboratory (2). Laboratory. Study of human microscopic and gross anatomical materials. Concurrent registration or passing grade (C) in PTH&AS 201 required.

222—Gross Human Anatomy (The Health Related Professions) (7). Gross structure and neuroanatomy of the human body; dissection of extremities, back, head, neck abdomen and thorax. Prerequisites: instructor's consent.

251—Interpretations of Lab Procedures in Primary Health Care (1). Discussion and analysis of selected laboratory test procedures used in office and clinic settings involved with primary health care. Prerequisites: graduate level Physiology course and departmental consent. f.

300—Problems (1-99). Regions or systems which may include developmental, microscopic, and gross anatomy. Prerequisite: instructor's consent.

301—Human Developmental and Gross Anatomy (10). General principles of systemic and developmental anatomy. Gross anatomy and dissection of back, upper and lower extremities, head and neck, thorax, abdomen and pelvis. Prerequisites: graduate standing and instructor's consent.

304—Human Histology and Organology (4). Detailed study of cytology, histology and microscopic anatomy. Prerequisites: 10 hours of Biology and instructor's consent. f,w.

305—Anatomy of the Human Nervous System (3). A comprehensive consideration of the morphology of the nervous system, emphasizing correlation of structure and function. Prerequisites: 201, Comparative Anatomy or equivalent, and instructor's consent. w.

306—Autonomic Nervous System (2). A comprehensive consideration of the autonomic nervous system in man, with emphasis on morphology. Prerequisites: 201, Comparative Anatomy or equivalent, and instructor's consent. f.

308—Hematopoietic Organs (2). Morphological and functional relationships of the blood-forming organs. Prerequisites: Basic Histology & instructor's consent. w.

310—General Pathology (5). Basic pathological mechanisms of human disease. Introductory principles of clinical laboratory measurements of altered organ system function studied. Prerequisites: Biochemistry 206, Physiology 250; PTH&AS 301, 302, 304, 305; and instructor's consent. f.

311—General Pathology Laboratory (3). Gross and microscopic applied study of basic pathological disease mechanisms. Laboratory assessment of these basic disease mechanisms. Prerequisites: Biochemistry 206, Physiology 250; PTH&AS 301, 302, 304, 305; or the equivalents; and instructor's consent. f.

312—Advanced Pathology (5). Demonstration and simulation study of gross, microscopic and clinical laboratory pathology of major human organ systems. Prerequisites: 310 and 311 or equivalent and instructor's consent. w.

313—Advanced Pathology Laboratory (3). Demonstration and simulation and character of work depend upon needs, qualifications, and of major human organ systems. Prerequisites: 310 and 311 or equivalent and instructor's consent. w.

404—Advanced Pathology (1-99). Graduate course in which amount and character of work depends upon needs, qualifications, and interests of student. Prerequisite: instructor's consent.

410—Seminar (1). Presentation and discussion of original investigations and current literature. f,w.

450—Research (1-99). Work equal to research in 490, but not leading to dissertation. Prerequisite: instructor's consent.

490—Research (1-99). Work leading to dissertation. Graded on a S/U basis only.

491—Research (1-99). Open only to properly qualified graduate students, with counsel of faculty. Includes preparation of dissertation.

Peace Studies

College of Arts and Science
19 Parker Hall (573) 882-6060

The College of Arts and Science does not offer a graduate degree in peace studies, but some courses are available to graduate students.

COURSES

201—Topics in Peace Studies (2-3). Organized study of selected topics in Peace Studies. Subjects and credit hours may vary from semester to semester. Prerequisite: sophomore standing.

213—Political and Social Philosophy (3). (same as Philosophy 213). Contemporary and/or historical theories of justice and the state. Utilitarianism, liberalism, libertarianism, Marxism, Communitarianism and feminism may be among the views covered. Prerequisite: sophomore standing.

215—Collective Behavior (3). (same as Sociology 215).

224—Literature of the Spanish Civil War (3). A study of the Spanish Civil War in all its manifestations: political, historical, ideological and literary. Special attention will be devoted to literature as a means of conveying ideas on war and peace. Prerequisite: 50.

245—Nonviolence in the Modern World (3). (same as History 245 and South Asia Studies 245). Readings on recent world history, emphasis on Gandi and nonviolent tradition in America Europe and the Third World. Prerequisite: sophomore standing.

252—America in the 1960's (3). (same as History 252). Examines the political and cultural main currents of the 1960s. Emphasizes the challenges mounted by protest groups and the responses of America's political leadership to the ferment of the period. Prerequisite: sophomore standing.

261—The Third World: An Anthropological Perspective (3). (same as Anthropology 260).

271—Group Decision Making Processes (3). (same as Communications 271).

280—Internship (1-3). Students work in a peace-related agency or institution for 1 to 3 credit hours. Repeatable for maximum of 6 hours. Prerequisite: departmental consent. S/U graded only. f,w,s.

286—Race, Ethics, and Gender in International Relations (3). (same as Political Science 286). Explores topics often neglected in the study of international relations, including racism, the laws and ethics of warfare, human rights, and gender. Prerequisite: Political Science 55 or Peace Studies 50, instructor's consent.

288—Senior Thesis I (3). Senior essay on a Peace Studies topic requiring major research. Prerequisite: Peace Studies 50 and senior standing. f,w.

302—International Journalism (2). (same as Journalism 303). Requires approval of the Dean of the School of Journalism.

303—Politics and War (3). (same as Political Science 303).

322—Philosophy of Behavioral and Social Sciences (3). (same as Philosophy 322).

326—Political Anthropology (3). (same as Anthropology 325).

350—Readings in Peace Studies (1-3). Students may receive 1 to 3 credit hours for doing readings and research in a particular area of peace studies. At least one paper will be required. Repeatable for a maximum of 6 hours. Prerequisite: instructor's consent. f,w,s.

354—Political Sociology (3). (same as Sociology 354).

355—Western Europe's Foreign Policy (3). (same as Political Science 355).

360—Economic Development (3). (same of Economics 360). The study of less-developed countries including problems of measureing economic growth, analysis of sources of economic growth, causes of changes in economic and social

structure, development and trade policies. The consequences of goals and assumptions for development policy are analyzed. Prerequisites: 229 and 251 or 351.

370—Political Development and Social Change (3). (same as Political Science 370).

371—American Foreign Policy from Colonial Times to 1898 (3). (same as History 370).

373—History of United States Foreign Relations, 1945 to Present (3). (same as History 373).

384—International Problems in the Middle East (3). (same as Political Science 384). Nature and causes of the Arab-Israeli Conflict, inter-Arab rivalries, the Persian Gulf Problems, and the involvement of external powers in these conflicts. Prerequisites: junior standing.

Pharmacology

School of Medicine
M517B Medical Sciences Building
(573) 882-7186

FACULTY

Hyun Dju Kim, chair, professor, PhD, Duke University. Regulation of ion transport by second messengers; energetics in cellular differentiation; erythropoietin action.

Robert W. Lim, director of graduate studies, associate professor, PhD, University of Washington-Seattle. Effect of growth factors and hormones on signal transduction and gene expression; control of cellular proliferation and differentiation.

Leonard R. Forte, professor, PhD, Vanderbilt University. Cell and molecular biology of the intestinal salt-regulating hormones, uroguanylin and guanylin; structure and activity of membrane guanylate cyclases that serve as receptors for peptide hormones.

Shivendra D. Shukla, professor, PhD, University of Liverpool. Signaling and molecular biology of platelet activating factor receptors; ethanol modulation of tyrosine and MAP kinases.

Albert Y. Sun, professor, PhD, Oregon State University. Relationship of structure and function of neural membranes; involvement of free radicals in causing neuronal degeneration.

John T. Turner, professor, PhD, University of Missouri-Columbia. Regulation of salivary gland secretion and development; molecular biology, pharmacology, and physiology of receptors for extracellular nucleotides.

Keith H. Byington, associate professor, PhD, University of South Dakota. Chemical mechanisms for the catecholamines; synthesis and testing of prodrugs for dopamine; toxicology of organometals.

Stephen P. Halenda, associate professor, PhD, Medical College of Virginia. Cellular signaling mechanisms; platelet physiology; phospholipases; receptor-tyrosine kinase signaling pathways.

Marilyn R. James-Kracke, associate professor, PhD, University of British Columbia. Ca^{2+} and pH regulation and membrane potential changes as part of the signal transduction pathway in various cell types (fluorescence techniques in general for cellular studies).

Peter A. Wilden, assistant professor, PhD, University of Iowa. Molecular mechanisms of intracellular signal transduction; hormone and growth factor receptors with tyrosine kinase activity; molecular basis of insulin action.

Judith A. Cole, research assistant professor, PhD, University of Connecticut. Transmembrane signaling mechanisms used by parathyroid hormone to regulate Na+-dependent phosphate transport in vitro; crosstalk between intracellular signaling pathways.

DEGREES: MS and PhD in pharmacology

Pharmacology is a basic medical science that deals with actions of drugs, hormones and neurotransmitters on living processes. Knowledge based on the results of pharmacological research leads to increased effectiveness and safety in the treatment of diseases in man and animals. Pharmacology is different from pharmacy, which is a profession concerned with the preparation and dispensing of drugs.

Graduate programs in pharmacology are designed to prepare students for academic teaching and research, research career positions in government, or industrial research in pharmacology. The research interests of various members of the department include a variety of approaches to the unsolved problems on mechanisms of drug action. Emphases are in cellular and molecular pharmacology. The major fields of research include neuropharmacology, pharmacokinetics, membrane transport, intracellular signaling mechanisms, molecular biology and receptor regulation mechanisms, and pharmacology of endocrine and exocrine glands. Cooperative interactions exist with other departments in the School of Medicine, including basic science departments such as biochemistry, physiology and molecular microbiology and immunology, as well as various clinical departments. There are also interactions with the Truman Veterans Hospital, the Dalton Cardiovascular Research Center, the College of Veterinary Medicine and campuswide programs in molecular biology and Food for the 21st Century. The cooperative research atmosphere encourages staff and students to work across departmental lines and provides a unique opportunity for training in many areas of pharmacology.

Applicants for an advanced degree should have a GPA of 3.0 (A=4.0) or higher in the last 60 hours of undergraduate work. Consideration is given to a variety of other criteria serving as predictors of probable success in graduate study. Performance on the general test of the GRE, letters of recommendation and previous laboratory or research experience are important factors in the admission decision. Several types of financial aid are available including research assistantships provided by the department and fellowships awarded by the Molecular Biology Program. Students may begin their program at the beginning of the fall, winter or summer sessions. Completed applications should be received by the pharmacology office no later than February 1 for fall semester entry or August 1 for winter semester. Women and minorities are encouraged to apply.

Additional information can be obtained from the Director of Graduate Studies in Pharmacology, M517B Medical Sciences Building, Columbia, MO 65212, or by visiting the dept. website: www.hsc.missouri.edu/som/pharmacology

DEGREE PROGRAMS: Admission to the PhD program is open to students with backgrounds in biology and chemistry and an understanding of mathematics and physics. Coursework in biochemistry and physiology is highly recommended. Deficiencies may be remedied during the first year of the graduate program. A bachelor's degree in either chemistry, biology, pharmacy or related areas from an accredited college is required.

The program of study includes two years of basic and advanced courses in pharmacology, as well as courses in cell and molecular biology.

During this period students also receive practical training and laboratory experience in modern methods of pharmacology research. At the end of this training phase students must pass a comprehensive examination. Finally, each student must carry out a research project, original in nature, which is expected to contribute new knowledge to the area of study.

To satisfy requirements for the MS degree, a student must complete the professional program of study with an average grade of B or better and pass an oral comprehensive examination over an acceptable master's thesis. Candidates also must comply with other regulations governing master's degrees. In the selection of students, preference is given to those who wish to enter the doctoral program.

The doctoral program normally requires four or five years beyond the baccalaureate degree. A master's degree is not required. Entrance directly into the PhD program is possible for students with an appropriate educational background. If a master's degree is received, either at MU or elsewhere, the program for the PhD degree usually requires two or three years of additional work. Candidates must pass a comprehensive written and oral examination over the field of pharmacology, complete an acceptable dissertation, pass a final oral examination of the dissertation and comply with all University or departmental regulations governing the PhD degree.

COURSES

204—Elements of Pharmacology (3). Introductory study of drugs commonly used in clinical medicine; particular reference to pharmacodynamics. Designed for medical science writers and nurses desiring a brief survey course. Prerequisite: Physiology 201 or equivalent. f,w.

305—Topics in Pharmacology (1-99.9). Selected topics not in regularly offered courses. Prerequisite: Instructor's consent.

310—Introduction to Pharmacology Literature (1). Practice reading and analyzing journal articles, polishing writing skills, and delivering oral research presentations from pharmacology literature and student laboratory experiences. Prerequisite: instructor's consent. f,w.

331—Principles of Drug Action I (4). A course for graduate students in pharmacology, toxicology and related fields emphasizing the physiological and biochemical principles of drug action. Discussion format. Prerequisite: Instructor's consent. f.

334—History of Pharmacology (1). Historical background of contemporary pharmacology. Prerequisite: instructor's consent.

400—Problems (1-99.9). Individual projects in pharmacology.

405—Pharmacology of Transmembrane Signaling (3). To develop state of the art knowledge (and emerging research issues) of drug actions on transmembrane signaling. Prerequisites: Pharmacology 331; Biochemistry 270 or 272, Physiology 250 or equivalent. f.

410—Seminar (2). Instruction in critical evaluation, review,

and summary of scientific data and practice in oral presentation of scientific research seminar. Taught in conjunction with weekly department seminar series. f,w.

427—Fate of Drugs in the Animal Body (2). (same as Veterinary Anatomy-Physiology 427). The course is concerned with the absorption, distribution, metabolism and elimination of drugs using a comparative approach. The pharmacokinetic aspects of elimination are stressed.

432—Principles of Drug Action II (3). A course for graduate students in pharmacology and related fields focusing on receptors as physiological regulators and targets of therapeutic agents, using the current literature in a discussion formate. Prerequisite: 331 or equivalent.

435—Neuropharmacology/Neurochemistry (3). (same as Biochemistry 469). Covers modern concepts and basic mechanisms about the central and peripheral nervous system to better understand pathophysiology of neurological diseases and mechanisms of drug action.

438—Neuropharmacology (3). Biochemical and behavioral actions of drugs affecting the nervous system. Effects of drugs on synaptic mechanism including neurotransmitter metabolism and receptor interactions. Effects of drugs on unconditioned and conditioned behavior. Prerequisite: 331 or equivalent. w.

450—Research (1-99.9). Opportunities for research in pharmacology, not leading to dissertation.

490—Research (1-99.9). Research in pharmacology, leading to dissertation. Graded on a S/U basis only.

Philosophy

College of Arts and Sciences
438 General Classroom Building (573) 882-2871

FACULTY

Joseph Bien, chair, professor, PhD, University of Paris.
Alexander von Schoenborn, director of graduate studies, associate professor, PhD, Tulane University.
William Bondeson, professor, PhD, University of Chicago.
Bina Gupta, professor, PhD, Southern Illinois University.
John Kultgen, professor, PhD, University of Chicago.
Peter Markie, professor, PhD, University of Massachusetts.
Donald E. Sievert, professor, PhD, University of Iowa.
Paul Weirich, professor, PhD, University of California-Los Angeles.
Andrew Melnyk, associate professor, PhD, Oxford University.
Robert Johnson, assistant professor, PhD, University of North Carolina.

DEGREES: MA and PhD in philosophy

A standard selection of undergraduate and graduate courses is provided, with advanced courses in areas determined by faculty members' specialties and graduate students' interests.

The department prepares philosophers and philosophy teachers by giving graduate students full responsibility for underclass sections of logic, ethics and introduction to philosophy. Faculty directors assist in the preparation of courses and, after class visits, suggest improvements in teaching techniques. The department offers a graduate seminar in the teaching of philosophy.

Publication of research by graduate students is encouraged. Prominent off-campus philosophers visit the department yearly for talks and symposia.

Fellowships and teaching assistantships are available to qualified students. Applications for fellowships must be submitted to meet Graduate School deadlines, usually in January, and for teaching assistantships to meet the department deadline of February 1.

For applications and information write the Director of Graduate Studies in Philosophy, 438 General Classroom Building, Columbia, MO 65211.

MASTER'S DEGREE: Graduate work in philosophy requires the equivalent of the following six undergraduate courses: logic, ethics, ancient western philosophy, early modern philosophy, 19th-century philosophy and contemporary philosophy.

Deficiencies may be made up after the student is enrolled at MU.

Normally requirements for acceptance for advisement are a GPA of 3.0 (A=4.0) in all undergraduate work for the last four semesters, with a 3.25 average in all philosophy courses, three letters of recommendation and the GRE general test. Applicants are judged not only based on grades and test scores, but also on the general reputation of their undergraduate institution, recommendations and other evidence of serious intent and intellectual ability. Any unusual circumstances regarding failure to meet the minimum requirements should be called to the attention of the director of graduate studies.

MA degree requirements are 30 semester hours of graduate work, 15 of which must be at the 400 level.

At least 80 percent of the hours submitted for the master's program must be completed with a grade of A or B.

The MA requires a thesis or alternative written performance displaying sustained research and philosophical analysis.

DOCTORAL DEGREE: For students entering the graduate program for the first time, acceptable performance on the GRE is required. Applicants are required to have three letters of recommendation from persons familiar with their previous work in philosophy and are urged to submit other evidence of serious intent and intellectual ability.

Candidacy is established by a qualifying examination. Superior performance on the MA may be accepted as the qualifying examination.

Requirements for the PhD are:

- A distribution of graduate courses among groups defined by the department. These include courses devoted to topics, figures and movements of the past and present. The distribution requirement occupies about half of the student's residency.
- A comprehensive examination at the end of residency, testing the student's familiarity with the literature and ability to analyze the issues pertaining to a topic or problem, or the thought of a figure in four areas: epistemology, metaphysics, axiology and history of philosophy;
- Ability to read philosophical texts with facility in a non-native language such as Greek, Latin, German, French, Spanish or Italian. Another language may be substituted with the approval of the department if it is not the student's native tongue and is relevant to doctoral research.
- A dissertation and a final oral examination on the dissertation.

COURSES

202—Medieval Philosophy (3). Major thinkers from St. Augustine through 14th century Ockhamists. Prerequisite: sophomore standing.

204—Ancient Western Philosophy (3). Philosophical thought on nature, knowledge, the gods, human life and society, from Thales to Augustine. Emphasis on Plato and Aristotle. The relevance of the ancients to contemporary life. Prerequisite: sophomore standing.

205—Early Modern Philosophy (3). Surveys critical and speculative thinking of modern period from Descartes to Kant in relation to scientific, religious and social movements. Prerequisite: sophomore standing.

206—Kant to Hegel (3). Focus on the philosophic accomplishments of this very brief and yet extremely fertile period of the Enlightenment's transformation through Romanticism. Prerequisite: sophomore standing.

207—19th Century Philosophy (3). A careful and sympathetic study of some of the major thinkers of this period, notably Kierkegaard and Nietzsche. Prerequisite: sophomore standing.

208—Contemporary Philosophy (3). The course will be a survey of some of the notable philsophers/thinkers whose contributions have been made in the twentieth century, eg., Russell, Wittgenstein, Sartre, Freud, Dennett and Searle. Prerequisite: sophomore standing.

212—Existentialism (3). The nature of human existence, the meaning of life, the relation of the individual to nature, society, and any gods that may be, according to Kierkegaard, Nietzsche, Heidegger, Sartre, de Beauvoir, Camus and others. Students are encouraged to come to grips with the issues in relation to their own lives. Prerequisite: sophomore standing.

213—Political and Social Philosophy (3). (same as Peace Studies 213). Contemporary and/or historical theories of justice and the state, Utilitarianism, liberalism, Libertarianism, Marxism, communitarianism and feminism may be among the views covered. Prerequisite: sophomore standing.

214—Ethical Issues in Business (3). Major theories of moral obligation and justice and their application to business practices. Corporate responsibility, government regulation, investment and production, advertisement, the environment, preferential hiring, etc. through case studies, legal opinions and philosophical analysis. Prerequisite: sophomore standing.

220—Comparative Feminist Ideologies (3). (same as Women Studies 220). Prerequisite: junior standing and/or Women Studies 105.

230—Philosophy and Intellectual Revolution (3). Examines such revolutions as the Copernican, Darwinian, Marxian and Freudian. What are the new views? How is man's place in the universe affected? What puzzles arise in replacing old by new views? Prerequisite: sophomore standing.

298—Honors I (3). Special work for Honors candidates.

299—Honors II (3). Special work for Honors candidates.

301—Topics (1-99.9). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing and instructor's consent, departmental consent for repetition.

302—Epistemology (3). An examination of contemporary philosophical theories concerning the nature, sources and limits of knowledge and justified belief. Previous work in Philosophy 1, Philosophy 204 or Philosophy 205 is recommended.

303—Selected Modern Philosophers (3). Advanced study of a particular philosopher or a number of philosophers from

the same school in the modern period. May be taken twice for credit with permission of the department. Prerequisite: junior standing.

304—Selected Contemporary Philosophers (3). Advanced study of a particular philosopher or philosophers from the same school in the 20th century. May be taken twice for credit with permission of the department. Prerequisite: junior standing.

305—Metaphysics (3). Metaphysics studies what there is and how things are, most generally speaking. Topics may include realism versus nominalism, substance and attribute, facts, modality, identity and causality. Previous work in Philosophy 1, 204, and 205 recommended

314—Formal Logic (3). (same as Linguistics 314). Presents the method of truth trees for sentence and predicate logic. Examines proofs concerning the decidability, soundness, and completeness of formal systems. Emphasizes the theory of formal systems. Prerequisite: 153 or graduate status.

316—Intermediate Logic (3). Critical examination of so-called "alternative logics"; their uses to solve philosophical problems. Prerequisite: 314.

318—Advanced Symbolic Logic (3). Elementary set theory. Modal logic, the logic of possibility and necessity. Prerequisite: 153 or 314.

320—Philosophy of Science (3). Why believe the scientific world-view? What, if anything, is the scientific method? Are today's theories really superior to the past theories? Examines contemporary philsophical answers to such questions. Prerequisite: junior standing and 10 hours science.

322—Philosophy of Behavioral and Social Science (3). (same as Peace Studies 322). Nature of the social sciences; their relation to natural science; problems of value and social control. Prerequisites: junior standing and hours Social Science.

323—Philosophy of History (3). Readings from classic and contemporary philosophers of history. Problems about nature and limits of historical knowledge; relation between history and other disciplines; the existence, nature, and kinds of historical laws. Prerequisite: junior standing.

328—Philosophy of Mind (3). Considers theories and arguments in contemporary philosophy of mind, focusing on the nature of mental states, their relation to brain states and the plausibility of various materialist theories of the mind. Prerequisite: junior standing.

330—Logical Theory (3). Critical examination of subject matter and task of logic as seen from the traditional point of view and from that of symbolic logic, inductive logic, idealism, pragmatism, realism. Prerequisites: junior standing and course in Logic.

331—Medical Ethics (3). Considers moral issues posed by developments in biological sciences and medical technology. Topics may include: genetic engineering, abortion and euthanasia, distribution of health care. Prerequisite: junior standing.

332—Philosophy of Law (3). What is law? Are there pre- or translegal rights? Is punishment justifiable? How can judicial decisions be justified? What are the relations between law and morality? Prerequisite: junior standing.

341—Marxism (3). A philosophical examination of (a) the notion of critique as seen in Marx's early and middle writings, and (b) specific topics by such authors as Lenin, Lukacs and Plekhanov. Prerequisite: junior standing.

350—Special Readings (1-3). Prerequisite: junior standing.

360—Asian Philosophy (3). (same as South Asia Studies 360). This course traces the origins of Indian and Chinese philosophical world views. Included are the major ideas in Hindu, Jaina, and Buddhist thought in India, and Taoism and Confucianism in China. Emphasis is placed on the diverse, assimilative, and pragmatic nature of Indian thought and its impact on contemporary Asian philosophy. Prerequisite: junior standing. f.

362—Philosophy of India (3). (same as South Asia Studies 362). General development of Indian philosophy. Prerequisite: junior standing.

364—Contemporary Indian Philosophy (3). (same as South Asia Studies 364). Indian philosophical traditions as represented in backgrounds of Gandhi, Tagore, Ramkrishna, and philosophical systems of Radharkrishnan, Aurobindo, etc. Prerequisite: junior standing.

366—Theories of Ethics (3). Normative and meta-ethical theories. Topics may include the rationality and objectivity of morality, the meaning of moral language, the differences between deontological, utilitarian and virtue theories. Prerequisite: junior standing.

390—Senior Seminar (3). A capstone course required of and only open to senior Philosophy majors. Course content will vary, depending on the professor teaching the course and the interest of the respective senior philosophy major.

405—Teaching of Philosophy (1). Seminar meetings on course design, teaching methods, the evaluation of teaching, grading, instructor obligations, and teaching aids. Some individualized instruction, including help preparing for and assessing the effectiveness of practice teaching.

406—The Teaching of Philosophy II (1). A sequel to 405. Includes a re-examination of end of semester tasks such as the composition and grading of finals and the assignment of course grades. Prerequisite: 405.

410—Seminar (3). Special topics. May be repeated for credit.

411—Ethical Theory (3). Contemporary theories of the right and the good. Metaethical topics such as moral language, reasoning justification.

415—Metaphysics (3). Theories of the categories and structures of reality, e.g., appearance and reality, causality, space and time, God, Nature, the human being.

418—Epistemology (3). Knowledge and opinion, the types, sources, and extent of knowledge, according to a variety of views.

421—Plato (3). Advanced studies in Plato; emphasis on recent scholarship.

423—Aristotle (3). Advanced studies in Aristotle; emphasis on recent scholarship.

430—The Rationalists (3). Interpretation and evaluation of major works of Descartes, Leibniz, and/or Spinoza in relation to their historical context and current philosophical problems.

435—The Empiricists (3). Epistemological and metaphysical doctrines of Locke, Berkeley and Hume.

436—Kant (3). Critique of Pure Reason: historical context, meaning and cohesion of its claims, critical assessment of them.

439—Topics in the History of Ethics (3). Advanced study of the ethical views of major historical figures ancient and/or modern.

440—History of Eastern Ethics (3). Historical survey of major eastern ethical theories. Explores broad range of ethical theories developed in Asia: Hindu and Buddhist in India; Toaism and Confucianism in China; and Zen in Japan.

441—Hegel (3). Phenomenology of Spirit: historical context, meaning and cohesion of its claims, critical assessment of them.

449—Marxism (3). Basic works of Marx and his successors.

450—Research (1-99.9). Research not leading to thesis.

452—Medieval Thinkers (3). Selected works of one or more: Augustine, Avicenna, Anselm, Maimonides, Aquinas, Scotus, Ockham. Not a survey. Prerequisite: graduate standing.

455—Phenomenology (3). Selected works of Husserl and other phenomenological thinkers. Implications for epistemology, science, metaphysics, ethics, and other philosophical topics.

456—Whitehead (3). Process and Reality and other works. Contributions to metaphysics, theology, epistemology, and philosophy of science.

458—Heidegger (3). Being and Time: historical context, meaning and cohesion of its claims, critical assessment of them.

459—Existentialism (3). Being and Nothingness and other philosophy and literary works.

460—Recent Anglo-American Philosophy (3). Topics on which current philosophers of the "Anglo-American or "Analytic" tradition are concentrating.

461—Recent Continental Philosophy (3). Topics on which current philosophers on the European continent are concentrating.

465—Applied Ethics (3). Methods for applying normative ethical theories to personal and social moral problems, illustrated by application of consequentialist, deontological and virtue-centered theories to such problems as euthanisia, capital punishment, pornography, world hunger, war and environmentalism.

470—Decision Theory (6). Principles for making rational decisions, including principles of expected utility theory, game theory, and social choice theory. A survey of basic ideas and an introduction to selected research topics. Prerequisite: 314.

472—Social and Political Philosophy (3). Topics of current interest in social and political philosophy. generally one of the following: social contract theory, utiltarianism, voting procedures, or convection. Prerequisite: 213 or instructor's consent.

473—Philosophy of Science (3). Examines central issues in general philosophy of science concerning the scientific method and the role in it of observation, the nature of rational theory-choice, progress, and the status of theories postulating unobservables.

474—Seminar in Logic (3). Topics of current interest in logic. Generally one of the following: inductive logic, set theory, conditionals, epistemic logic, or formal semantics. Prerequisite: 314.

475—Indian Philosophy (3). Reality, levels of being, status of the world, nature of knowledge in Indian philosophy in relations in Advaita Vendanta system of Samkara.

476—Philosophy of Mind and Psychology (3). Survey of important recent work in contemporary philosophy of mind and psychology. Graduate seminar.

477—Foundations of Cognitive Science (3). Examination of philosophical questions arising in cognitive science concerning, for instance, the nature of computation and representation, inter-disciplinary relations, the nature of cognitive scientific explanation, and it relation to folk psychological explanation.

490—Research (1-99.9). Work toward preparation of thesis or dissertation. Graded on a S/U basis only.

Physical Therapy

School of Health Related Professions
106 Lewis Hall (573) 882-7103

FACULTY

Marilyn Sanford, chair, clinical associate professor, PhD, PT, University of Missouri-Columbia. Orthopedics and geriatrics.

Gerald Browning, associate director of School of Health Related Professions, PhD, University of Missouri-Columbia, PT, St. Louis University. Orthopedics, professional issues.

Carmen Abbott, clinical instructor, MA, PT, University of Missouri-Columbia. Therapeutic exercise, physical agents.

Connie Blow, clinical instructor, MS, University of North Carolina, PT, University of Missouri-Columbia. Pediatrics.

Kyle Gibson, academic coordinator of clinical education, clinical instructor, MA, University of Missouri-Columbia, PT, Northern Illinois

University. Orthopedics.

Marian Minor, associate professor, PhD, University of Missouri-Columbia, PT, University of Kansas. Arthritis, community-based exercise programs.

Charlene Roberts, assistant professor, PhD, PT, University of Missouri-Columbia. Kinesiology, prosthetics.

Karen Wingert, clinical assistant professor, MA, University of Missouri-Kansas City, PT, University of Missouri-Columbia. Adult neurology, clinical medicine/oncology.

DEGREE: Master of Physical Therapy (MPT)

The Department of Physical Therapy offers a 151 credit hour, 5-year clinical master's degree that prepares the graduate for entry-level physical therapy practice. The program is accredited by the Commission on Accreditation in Physical Therapy (CAPTE). Graduates are eligible for licensure anywhere in the United States. More than 200 clinical sites in Missouri and beyond are available for supervised clinical education. The department maintains a classroom, teaching and research laboratories, and space for small group activities. The program combines traditional lecture and laboratory classes with an increasingly problem-based curriculum at the upper levels of study. Students may apply for scholarships, work-study positions, and fellowships. A limited number of graduate teaching and research assistantships are available.

Admission to the master's degree program is selective, and is restricted to Missouri residents. Up to 50 students are admitted each year for the curriculum that starts during the summer term. Applicants must have completed two years of prerequisite course work, or the equivalent. Students may enter the master's program as graduate students if they have a 4 year degree, or as pre-professional physical therapy students at the undergraduate level, transferring to graduate student status when a minimum of 120 credit hours and the Graduate Record Examination (GRE) have been completed.

Applications to the professional program must be requested from the department, in writing, between September 1 and December 31 for the class that will start the following summer. The deadline to receive completed applications is January 31. Applicants must submit:

- a completed application.
- official transcripts from all colleges or universities attended.
- a minimum grade point average of 3.0 in prerequisite courses (4.0 system).
- GRE scores (ACT or SAT scores if applicant does not yet have a 4 year degree).
- evidence of 40 hours of observation in two or more physical therapy clinical settings.
- a resume or curriculum vita.
- two recommendation forms (included in the application packet).

If English is spoken as a second language, the applicant must submit:

- a TOEFL score of 600 or above, and a TSE score of 280 or above.

Application to the university does not have to be completed until the candidate is notified of acceptance to the physical therapy program, usually by mid-April.

Students must maintain a minimum 3.0 GPA throughout the program with no grade lower than "C" (2.0). Students must demonstrate the personal qualities and characteristics associated with patient welfare and professional trust.

For additional information about the master of physical therapy degree, write, telephone, or fax the Department of Physical Therapy, 106 Lewis Hall, Columbia, MO 65211, (573) 882-7103 (telephone) or (573) 884=8369 (fax).

COURSES

203—Foundations of Therapeutic Exercise (3). Physiologic basis of therapeutic exercise with emphasis on effects on the musculoskeletal and cardiopulmonary systems; principles of exercise prescription; types and methods of exercise.

204—Introduction to Orthopedic Physical Therapy (3). Physical therapy diagnosis, management, and prevention of disorders of the musculoskeletal system; basics of orthopedic manual therapy. Includes laboratory.

213—Clinical Evaluation and Procedures (3). Principles and procedures of basic evaluation methods and documentation: muscle strength, range of motion, muscle balance, posture, neurologic tests. Includes laboratory.

214—Physical Agents (3). Biophysics, theory and technique concerning the use of physical agents as adjuncts to exercise programs. Includes thermal, electrical, light, hydrotherapy and mechanical agents.

220—Introduction to Physical Therapy (1). History of physical therapy: the profession; basic skills: first aid, infection control, vital signs; medical terminology.

223—Introduction to Clinical Education I (1). Focus on professional attributes of communication, teamwork, problem solving, and therapeutic behaviors in a case-based format. Graded on S/U basis only.

224—Introduction to Clinical Education II (1). Continuation of Introduction to Clinical Education I with increased time in clinical settings. Graded on S/U basis only.

234—Clinical Pathophysiology (3). Abnormal function of organ systems in the presence of disease; clinical manifestations and medical management.

243—Applied Neurophysiology for Allied Health Students (3). (same as Communicative Science and Disorders 243 and Occupational Therapy 243OT). Principles of basic neurophysiology, emphasizing correlation of structure and function of the nervous system.

254—Movement Theory and Application (2). Human sensorimotor development; motor learning; motor control theories; developmental and practical appplication to exercise; proprioceptive neuromuscular facilitation.

300—Problems in Physical Therapy (1-3). Independent study, based upon educational goals, leading to completion of a project or paper. Specific objectives and time line developed with the supervision of a faculty member. Prerequisite: instructor's consent.

301—Topics in Physical Therapy (1-3). Organized study of a specified area of interest in physical therapy and related subjects. Topics and credit hours will vary. Prerequisite: instructor's consent.

303—Evidence-Based Practice (3). Clinical research design and methods overview. Critical review of current and historically important profession literature. Effective writing related to clinically applicable research using computer and library resources. Identification of research questions. Prerequisite: departmental consent.

304—Professional Issues in the Twenty-First Century (3). The physical therapist as health care professional, administrator, and educator; legal, ethical, and political issues. Service delivery management; delegation of care; rural vs. urban health care needs.

305—Orthopedic Physical Therapy (3). Physical therapy diagnosis, management, and prevention of disorders of the musculoskeletal system; continuation of orthopedic manual therapy emphsizing the axial skeleton; traction; massage; taping; sport-specific injury rehabilitation; orthotics. Prerequisites: 204.

316—Physical Therapy Case Management I (5). Evaluation and team approach to physical therapy management in adult medical and surgical conditions: cardiopulmonary, rheumatic, oncologic, integumentary or wound care, including major burn injury. Psychosocial and ethical issues incorporated. Problem based; laboratory.

323—Clinical Education I (3). Full time, supervised clinical experience addressing application of basic skills in patient evaluation and treatment, documentation and professional behaviors. Graded on S/U basis only.

324—Clinical Education II (5). Continuation of supervised clinical education. (Capstone course; Writing Intensive option.)

336—Pediatric Physical Therapy (3). Physical therapy evaluation and treatment of children with movement dysfunction. Emphasis on therapeutic exercise.

346—Rehabilitation of the Neurologically Impaired Adult (3). Physical Therapy evaluation and treatment of adults who have incurred neurological deficits; emphasis on the restorative care of individuals following spinal cord injury, stroke, and traumatic head injury.

350—Special Readings (1-3). Independent readings selected in consultation with supervising faculty member. Identified educational goals and activities; discussion, annotated bibliography or report. Prerequisite: instructor's consent.

375—Human Kinesiology (3). (same as Occupational Therapy 375OT and Health Related Professions 375). Study of principles of physical laws, biomechanics and anatomic structure relative to human movement. Applications through analysis of daily functional performance, exercise, and sport. Prerequisite: Human Anatomy. f.

376—Clinical Kinesiology (3). Advanced Kinesiology addressing functional mobility; specifics of normal human gait; pathokinetics of gait. Assistive devices; wheelchairs; orthoses and prostheses. Including laboratory.

400—Problems (1-3). Independent study and development of a clinical or research paper, poster or workshop suitable for presentation in a symposium or conference. Specific plan individually developed with advisor. Journal reviews. Prerequisites: graduate standing.

410—Seminar (3). Presentation and critical discussion of research activities, summaries of clinical and research experience. Prerequisite: departmental consent.

415—Case Management II (5). Complex orthopedic problems in persons of all ages; supervision, reimbursement, ethical/legal situations; community programs for injury prevention; work capacity evaluation/work hardening; consultation. Problem-based format; laboratory. Prerequisite: 316.

416—Case Management III (5). Traditional and contemporary theories of physical therapy in advanced rehabilitation of children and adults with neurologic disorders; education/employment, ethical/legal issues; patient/client advocacy. Problem based format; laboratory. Prerequisite: 346.

425—Clinical Education III (5). A continuation of supervised clinical education.

426—Clinical Education IV (5). A continuation of supervised clinical education.

Physics and Astronomy

College of Arts and Science
223 Physics Building (573) 882-3335
http://www.missouri.edu/~physwww/physics.html

FACULTY

Henry W. White, chair, professor, PhD, University of California-Riverside. Condensed matter.

H.R. Chandrasekhar, director of graduate studies, professor, PhD, Purdue University. Optical spectroscopy.
Jack Burns, professor, vice provost for research, PhD, Indiana University. Astronomy and Astrophysics.
Meera Chandrasekhar, professor, PhD, Brown University. Optical spectroscopy.
David L. Cowan, professor, PhD, University of Wisconsin. Condensed matter.
Brian DeFacio, professor, PhD, Texas A&M University. Mathematical physics.
Gabor Forgas, George H. Vineyard Distinguished Professor of Theoretical Physics, PhD. Biological Physics and Statistical Mechanics.
Louis V. Holroyd, professor emeritus, PhD, University of Notre Dame.
Bahram Mashhoon, professor, PhD, Princeton University. Relativity and gravitation.
Peter Pfeifer, professor, PhD, Swiss Federal Institute of Technology. Surface physics.
Patricia Plummer, professor, PhD, University of Texas. Chemical physics.
James J. Rhyne, professor, PhD, Iowa State University. Neutron scattering.
Sashi Satpathy, professor, PhD, University of Illinois. Solid condensed matter.
Guy Schupp, professor emeritus, PhD, Iowa State University. Mössbauer scattering.
Haskell Taub, professor, PhD, Cornell University. Condensed matter.
Clifford W. Tompson, professor emeritus, PhD, University of Missouri-Columbia.
Samuel A. Werner, professor, PhD, University of Michigan. Neutron scattering, condensed matter.
Joseph E. Willett, professor, PhD, University of Missouri-Columbia. Plasma theory.
Giovanni Vignale, professor, PhD, Northwestern University. Condensed matter.
Paul Miceli, associate professor, PhD, University of Illinois. Condensed matter.
Charles J. Peterson, associate professor, PhD, University of California-Berkeley. Observational astronomy.

ADJUNCT FACULTY

William Yelon, adjunct professor of physics, group leader at the Research Reactor Center, PhD, Carnegie Mellon University.
Ronald Berliner, adjunct associate professor of physics, senior research scientist at the Research Reactor Center, PhD, University of Illinois.
John Farmer, adjunct associate professor of physics, program director at the Research Reactor Center, PhD, Kansas State University.
Helmut Kaiser, adjunct associate professor of physics, senior research scientist at the Research Reactor Center, PhD, Technical University-Vienna, Austria.

DEGREES: MS and PhD in physics

MASTER'S DEGREES: The **master of science degree in physics** prepares students for a variety of scientific careers. Since physics is the most fundamental of the physical sciences, graduate-level studies in the field provide essential knowledge for application in many areas. Students with strong backgrounds in physics, as well as in areas ranging from biology to engineering, are encouraged to consider a personalized MS program in physics. Graduates have many job opportunities in a variety of areas.

In general, students must present at least 30 credit hours for the MS degree, including at least 15 hours in courses at the 400 level. The program must include at least 15 hours of physics courses. There is no foreign language requirement.

A formal thesis is not usually required for the MS degree, but some research is essential, including a report on the results, and three to six hours of research credit normally is required. Thesis credit may be earned for work done in the physics department, or in a related area, at the discretion of the student and advisory committee. Master's candidates must pass a qualifying examination and an oral examination before their graduation.

The **master of science (physical science)** degree is designed for those preparing to teach more than one science or for those broadening their foundation in science before proceeding to the doctoral degree. It emphasizes broad training in physics, chemistry and mathematics. No thesis is required.

Of the required 40 hours of graduate credit, 32 hours are distributed among the departments of physics, chemistry and mathematics, and eight hours are elected from other disciplines approved by the candidate's advisers. A student must complete at least eight hours in 400-level courses, which should not include more than three hours in seminar courses. This advanced work must be in the fields mentioned above. Mathematics 80 and 175, or their equivalents, should be presented for admission to candidacy or be taken without credit toward the degree. If not taken before admission, Mathematics 201 or its equivalent must be included in the program for the degree.

Graduate students in physics are expected to take a full and active part in departmental activities. Participation in research programs, departmental lectures and colloquia are considered a normal part of a graduate program.

DOCTORAL DEGREE: The doctor of philosophy degree is designed to educate scientists capable of independently formulating and solving problems of fundamental importance.

For acceptance as PhD degree candidates, students must pass a qualifying examination at an advanced level. The specific program of study for a PhD in physics, planned in consultation with the student's doctoral program committee, is selected to fit each student's academic background, experience and objectives. There is no foreign language requirement.

The candidate is required to pass a comprehensive examination. At the time of the examination, each candidate must have completed (or be currently enrolled in) all of the courses in their PhD program. In special cases, the comprehensive examination may be taken with one course outstanding.

The candidate shall carry out original research and present an acceptable doctoral dissertation on a topic approved by the candidate's program committee. The candidate must successfully defend the dissertation in a final examination.

COURSES
PHYSICS

215—Introduction to Modern Physics (3). Relativistic kinematics and Lorentz transformations historical basis for quantum mechanics; atomic structure; physics of solids; nuclear structure and decay. Prerequisite: 176.
260—Undergraduate Seminar II (1). Presentation of topics of current interest in physics by staff and students at junior-senior level. Prerequisite: one year of calculus-based physics.
275—The Mechanical Universe (3). Includes the basic elements of differential and integral calculus. Emphasis on Astronomical applications and on historical development. Offered through Continuing-Education. Prerequisite: working knowledge of College Algebra. cor.
296—Honors Problems in Physics (1-99.9).
300—Problems (1-99.9). Special studies for advanced undergraduate students in physics covering subjects not included in courses regularly offered.
301—Topics on Physics and Astronomy (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: Physics 176 or instructor's consent, departmental consent for repetition.
305—Electronic Data Processing (4). Acquaints students with techniques for the electronic acquisition and processing of physics data. Digital logic, integrated circuits, microprocessors and interfacing. Two lectures, 2 labs weekly. Prerequisite: 176.
306—Advanced Physics Laboratory I (3). Experiments in atomic, nuclear and solid state physics including X-ray and neutron diffraction, NMR and Mossbauer effect measurements. Experiments familiarize students with modern equipment found in most physics laboratories. Two 3-hour labs weekly. Prerequisites: 215 and 304.
307—Advanced Physics Laboratory II (3). Experiments include: superconductivity, resistivity, specific heat, optical, and computer-related measurements. Two 3-hour labs weekly. Prerequisites: 215 and 304.
310—Electricity and Magnetism I (3). Mathematical preliminaries. Properties of charge distributions at rest and in motion, the field concept, introduces electromagnetic radiation. Prerequisites: 176.
311—Light and Modern Optics (4). Interaction of light with matter, spectroscopic techniques, wave optics, interferometry, multilayer films, polarization, non-linear optics, design of optical instruments, matrix methods, waveguides, fiber optics, acousto-optic and photo-elastic modulation. Includes both lectures and laboratory. Prerequisite: Physics 176 or equivalent.
312—Introduction to Thermodynamics (3). Development of the concepts of temperature, heat, work, entropy, enthalpy and free energy. Applications to gases, liquids and solids. Statistical methods. Prerequisite: 176.
313—Electricity and Magnetism II (3). Application of Maxwell's equations. Prerequisite: 310.
314—Mechanics (3). Development of fundamental concepts, principles of mechanics using mathematical methods. Many problems used. Prerequisite: 176.
320—Observational Astronomy (3). (same as Astronomy 320). Elements of astronomical observational techniques and procedures for reduction of astronomical data: theory of the photographic plate. Emphasis on development of observing skills through use of the telescope. Prerequisite: 201 or equivalent.
326—Modern Physics Laboratory for Secondary Science Teachers (3).
340—Extragalactic Astronomy (3). (same as Astronomy 340).
375—Computational Methods in Physics (3). Use of modern computational techniques in solving a wide variety of problems in solid state, nuclear, quantum and statistical physics. Prerequisite: 215.
380—Introduction to Quantum Mechanics I (3). Foundations of wave mechanics; wave packets; Schrodinger equation and I-D problems; operators and eigenfunctions, spherically symmetric systems. Prerequisite: Mathematics 304.
381—Introduction to Quantum Mechanics II (3). Review

of quantum mechanics and units, forms of radiation, radiation detectors, spacetime symmetries, internal symmetries, nuclear structure and form factors, low-energy nuclear models, recent developments. Prerequisite: 380 or equivalent.

385—Modern Physics (3). Atomic and structure, spectra; quantum statistics; band theory of solids, free electrons, Bloch's Theorem, semiconductors; superconductivity; nuclear models and elementary particles. Prerequisite: 380.

400—Problems (1-99.9). Laboratory work involving study of literature of special experiments in physics. Introduces research methods.

401—Topics of Physics and Astronomy (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: instructor's consent. Departmental consent for repetition.

404—Study of Techniques of Teaching College Physics (1-3). Objectives, methods and problems related to teaching college physics. Some credit in this course is required for all students teaching physics. May repeat for 3 hours maximum.

411—Seminar in Physics (1). Topics of current interest selected for discussion. May be elected repeatedly. S/U Graded only. Prerequisite: 415

415—Condensed Matter Physics I (3). Crystal structure, reciprocal lattice, phonons, neutron and x-ray scattering, free electron theory of metals, Fermi surfaces, energy bands, static properties of solids, semiconductors, devices, and quantum structures, optical properties, excitons, introduction to magnetism and superconductivity. Prerequisites: 380 or equivalent.

416—Condensed Matter Physics II (3). The basic Hamiltonian, Phonons, theory of the electron gas, second quantization, Hartree and Hartree-Fock approximation, local-density method, tight-binding theory, electron-electron interaction and screening, Fermi liquid theory, transport properties, impurities, Green's function's, Localization, Quantum Hall effect, magnetism, superconductivity. Prerequisites: 415

420—Nuclear Physics I (3). Properties of nuclei and nuclear radiation, detection methods, high-energy nuclear phenomena. Prerequisite: 380.

432—Topics in Astronomy and Astrophysics (3). (same as Astronomy 432). Selected topics from solar system, stellar, galactic and extragalactic astronomy and astrophysics. May be repeated to a maximum of six hours. Prerequisite: instructor's consent.

440—Low Energy Neutron Scattering (3). Theory, application of low energy neutron scattering to investigation of structure and dynamics of aggregate matter including lattice vibrations, ordered spin systems, spin waves, diffusive motions in liquids; experimental techniques discussed. Prerequisite: 415.

445—Plasma Physics (3). Single particle motion, plasma kinetic theory, magnetohydrodynamics and other fluid theories, waves in unmagnetized and magnetized plasmas, transport phenomena, instabilities, controlled fusion. Prerequisite: instructor's consent.

450—Research (1-99.9). Graduate research.

461—Classical Mechanics (3). The interplay of dynamics and symmetry, Hamilton's principle and Noether's theorem, Lagrangian, Hamiltonian, Hamilton-Jacobi theories of mechanics in special relativity. Rigid body motion, small oscillation, canonical transformations and fields as continuous mechanical systems. Prerequisites: 314 or equivalent.

462—Electromagnetic Theory (3). Electrostatics, dielectrics, magnetostatics, method of images, Green's functions, Maxwell's equations, time-varying fields, plane electromagnetic wave propagation, reflection, refraction, wave guides. Additional topics may include plasma physics diffraction, radiation. Prerequisites: 461.

464—Electrodynamics (3). Tensor analysis, special theory of relativity and the Lorentz group. Classical theory of fields including variational principle, Noether's theorem and invariance principle. Microscopic Maxwell's equation, electromagnetic conservation laws and applications to radiation. Prerequisites: 462 or instructor's consent.

466—Methods in Mathematical Physics (3). Concentrates on mathematical techniques used in modern physics. Infinite series, functions of a complex variable, differential equations, Fourier series and integral, etc. Prerequisites: 370 or instructor's consent.

468—Thermodynamics and Statistical Mechanics (3). Thermodynamics as applied in physics, chemistry; laws of distribution; statistical methods of study matter, radiation. Prerequisite: 471 or concurrently.

471—Quantum Mechanics I (3). Non-relativistic quantum theory in Hilbert space. States and self-adjoint observables, unitary time evolution in various pictures, the path-integral, identical particles, Fock space, angular momentum and some pertubation theory. Prerequisites: 461.

472—Quantum Mechanics II (3). More perturbation theory, variational methods, semi-classical methods and application to radiation theory, linear response theory and rudiments of relativistic quantum mechanics including the Klein-Gordan equation and the Dirac equation. Prerequisites: 471.

473—Quantum Mechanics III (3). Properties of many-particle systems at low temperature. General Formalism for Fermi and Bose systems, theory of superconductivity and superfluidity, introduction to quantum spin model—Diagromatic formulation of quantum electrodynamics. Scattering of electrons and positions, introduction to radioactive corrections.

478—Topics in Solid State Theory (3). Selected topics in solid-state theory, including various elementary excitations in solids and their interactions. May be elected more than once. Prerequisite: instructor's consent.

482—Relativity and Gravitation (3). Special and general theories of relativity. Discussion of accelerated observers and the principles of equivalence. Einstein's gravitational field equations, black holes, gravitational waves and cosmology. Prerequisites: 461, 462.

486—Theory of Elementary Particles (3). Functional methods in field theory, renormalization group, symmetries in quantum fields, nonabelian gauge groups and the Yang-Mills equation, spontaneous broken symmetry, the GWS model for weak interactions, QCD, Gut models gravitational unification. Prerequisites: 420 and 473 or instructor's consent.

490—Research (1-99.9). Research leading to Ph.D. dissertation. Prerequisite: Ph.D. candidacy has bee established. Graded on a S/U basis only.

ASTRONOMY

201—Introduction to Modern Astrophysics (3). (same as Physics 201). Elements of stellar, and galactic astrophysics. Interpretation of observations and physical conditions of various astronomical objects including stars, gaseous nubulea and , galaxies. Prerequisite: Physics 176.

300—Problems (1-99.9). Special studies in astronomy; covers subjects not included in courses regularly offered. Prerequisite: instructor's consent.

320—Observational Astronomy (3). (same as Physics 320). Elements of astronomical observational techniques and procedures for reduction of astronomical data and theory of the photographic plate. Prerequisite: Astronomy 201 or equivalent.

340—Extragalactic Astronomy (3). (same as Physics 340). Observational properties of normal galaxies and clusters of galaxies; theory of structure and dynamics of galaxies; interacting galaxies, Seyfert and emission-line galaxies, quasi-stellar objects. Introduction to cosmology. Prerequisites: 201, 335 or instructor's consent.

Physiology

School of Medicine
MA415 Medical Sciences Building
(573) 882-4957

FACULTY

Allan W. Jones, chair, professor, PhD, University of Pennsylvania.

Edward H. Blaine, director of the Dalton Cardiovascular Research Center, professor, PhD, University of Missouri-Columbia.

James O. Davis, professor emeritus, MD, Washington University-St. Louis, PhD, University of Missouri-Columbia.

E. Lee Forker, professor emeritus, MD, University of Pittsburgh.

Dean Franklin, professor emeritus, Dalton Cardiovascular Research Center.

Ronald H. Freeman, professor, PhD, University of Indiana.

Douglas M. Griggs Jr., professor emeritus, MD, University of Virginia.

Thomas W. Hurley, professor, PhD, Duke University.

Virginia H. Huxley, professor, PhD, University of Virginia.

M. Harold Laughlin, professor, PhD, University of Iowa.

Mark A. Milanick, professor, PhD, University of Chicago.

Wesley D. Platner, professor emeritus, PhD, University of Missouri-Columbia.

Michael J. Rovetto, professor, PhD, University of Virginia.

Marvin L. Zatzman, professor emeritus, PhD, The Ohio State University.

Lené Holland, associate professor, PhD, University of California-San Francisco.

Timothy A. Jones, associate professor, PhD, University of California-Davis.

Kerry McDonald, assistant professor, PhD, Marquette University, Milwaukee, Wisconsin.

Michael S. Sturek, associate professor, PhD, University of Iowa.

Daniel Villarreal, associate professor, MD, The National University of Mexico.

J. Thomas Cunningham, assistant professor, PhD, University of Iowa.

Christopher Hardin, assistant professor, PhD, University of Cincinnati.

Tzyh-Chang Hwang, assistant professor, MD, National Yang-Ming Medical College, Taiwan, PhD, Johns Hopkins University School of Medicine.

DEGREES: MS and PhD in physiology

COOPERATIVE DEGREE: MD and PhD in physiology

The Department of Physiology offers graduate programs leading to the doctor of philosophy and, in special cases, the master of science. Programs are designed to create the professional capable of developing new knowledge through independent research and of sharing that knowledge through teaching. Each program is carefully adapted to the student's needs and strengths so that maximum intellectual benefit can be derived from the varied experiences offered by the faculty. The department uses the many complementary disciplines across the campus to increase the student's scientific depth and breadth.

The graduate experience in the department provides total involvement in physiological research in mammalian systems with applications to medicine, molecular biology, veterinary medicine, engineering and related fields. The department encourages students to enter the PhD program, but the faculty recognize that the MS degree can serve as an introductory experience for one who is seeking an increased understanding of physiological principles.

Teaching skills are enhanced by requiring all graduate students to participate in laboratory or lecture instruction offered by the department. Such experience contributes to professional maturity and reinforces a sense of collegiality between students and faculty.

Unique opportunities exist for those interested in combining the PhD program with training for the MD degree. Combination of such skills leads to an exciting career in which clinical approaches are supplemented by the application of research techniques.

The PhD program is designed to prepare the individual for a career in research and teaching. The culmination of this program is the completion of a meritorious and original research project, writing a dissertation on that research, and defending the dissertation before a faculty committee. It is strongly recommended that the young professional's academic education be furthered with two or more years of postdoctoral training. Postdoctoral fellows in the department contribute to the education of degree candidates.

The departmental faculty have expertise in a variety of mammalian systems, including cardiovascular, renal, neurological, and endocrine physiology. A number of different experimental models are used in the laboratory, ranging from the whole animal to subcellular biochemical and molecular events. Modern molecular biological techniques are employed to probe the genetic expression of the cell. Research problems under current investigation include hormonal mechanisms responsible for the development of hypertension; the growth and function of collateral vessels in the heart; membrane regulation of vascular smooth muscle; ionic transport across cell membranes; the nature of barriers separating circulating blood and tissue; energetics and integrated metabolism of vascular smooth muscle; exercise physiology; nervous system integration of sensory stimuli; energy production and metabolism in normal and diseased hearts; cardiogenic shock; electrophysiology of isolated cardiac cells; and hormonal induction of genetic transcription.

Departmental members maintain research laboratories on the fourth floor of the Medical Sciences Building, in the Truman Veterans Hospital, in the Dalton Cardiovascular Research Center and in the College of Veterinary Medicine Equine Center. The laboratories have a wide range of sophisticated physiological instrumentation for gathering chemical and physical data of exacting dimensions. The diversity of disciplines across campus and the sense of collegial cooperation provide excellent opportunities to collaborate and thus create unique approaches to problem-solving in physiology.

Laboratories are available for research on large and small mammals as well as isolated tissues. Faculty and students use electronic recording instruments, scintillation counters, atomic absorption spectrometry, autoanalyzers, high performance liquid chromatography, nuclear magnetic resonance spectroscopy, analog and digital computers, recording spectrophotometers, and other equipment for accurate analysis of physiological information. General service facilities also in use at MU are those for animal care, the nuclear research reactor, the nuclear magnetic resonance spectroscopy facility, and the computer center.

The Health Sciences Library's extensive scientific collection, available to students and staff, is supplemented by a small but conveniently located departmental library.

DEGREE PROGRAMS: To enter degree programs in the department each applicant must meet Graduate School requirements and complete a departmental application form. In addition, three letters of recommendation are required from individuals knowledgeable about the student's academic capabilities. The Graduate Record Examination (GRE) should have been taken within the last four years and the scores sent directly to the department by the Educational Testing Service. The applicant should score in the upper 50th percentile in the GRE general test. Each applicant is encouraged to take a GRE subject test in one or more of the following: biology, chemistry, engineering, mathematics, physics or psychology.

Departmental expectations are that students wanting to gain entrance into the program will have a college major or minor in biology, chemistry, engineering, psychology or related fields. It also is expected that the applicant will have had one year of college physics and one year of mathematics through calculus. Superior students who lack any of the above course work will have the opportunity to make up deficiencies during the early part of their graduate school careers.

To obtain a master's degree, the minimum course requirements are 30 hours of graduate credit; 15 or more hours must be at the 400 level and no more than 12 graduate credit hours may be in research, readings or problem courses. There is no language requirement for the MS degree. The typical candidate will take advanced courses in physiology as well as courses in biochemistry and statistics. In addition, the student's adviser will designate other courses needed to give breadth to the program or to remedy deficiencies in the candidate's academic background. Thus the program frequently exceeds the minimum 30 hours. The candidate must submit a thesis and defend it in an oral examination.

MU requires a minimum of 72 semester hours beyond the baccalaureate degree for the PhD. In the doctoral program, the course work must include a minimum of 15 hours at the 400 level (excluding research problems and independent study experiences). As with the master's degree, there is no language requirement. Applicants are examined at the end of the first year to determine their qualifications to continue as a candidate for the degree. After this period, the candidate:

- Completes the program of study approved by the candidate's adviser and doctoral program committee
- Passes a comprehensive examination in mammalian physiology and related fields deemed essential by the doctoral program committee
- Completes a meritorious and original research project for the dissertation.

FINANCIAL SUPPORT for qualified graduate students is available from several sources. The department has a federally funded training grant of long standing, and institutional teaching assistantships can be obtained. University fellowships are available on a competitive basis. Deadlines for these fellowships are set early each year. Therefore, a prospective candidate should submit an application to the department in the preceding fall. In addition, students may be supported by faculty research grants. Dr. Ronald Freeman, co-director of graduate studies, should be contacted for information about the application process and sources of financial support. A brochure is available describing research interests and activities in the department.

COURSES

201—Elements of Physiology (5). Beginning course for upper-class and graduate students designed to cover the basic functional aspects of all systems of the body. Prerequisite: 5 hours biology or its equivalent, instructor's consent.

300—Problems (1-3). We have requests from undergraduate students for a problems course which will provide an opportunity to explore research in physiology. We expect these requests to increase upon implementation of a program to offer early acceptance into medical school to highly qualified undergraduate students. Individual studies, minor research problems. f,w,s.

305—Mammalian Physiology (3-4). Basic principles in the physiology of cells, membranes, muscle, and the central nervous system. Laboratory (1 hr). Grading by written exams. Prerequisite: instructor's consent.

400—Problems (1-99.9). Guided study to strengthen knowledge in physiology. Prerequisite: instructor's consent.

401—Topics (1-3). Prerequisite: instructor's consent.

405—Principles of Mammalian Physiology II (5-6). Organ control in cardiovascular, respiratory, renal, gastrointestinal, and endocrine systems. Laboratory (1 hr.) - exploration in basic and advanced physiological concepts. Grading by written exams. Prerequisites: Physiology 305 or equivalent, instructor's consent.

410—Seminar (1). Presentation of subjects in physiology. f,w.

418—Advanced Mammalian Physiology (3). Critical study of current status of various topics in mammalian physiology. Prerequisite: instructor's consent. w.

420—Mammalian Membrane Physiology (3). Advanced discussions of membrane transport behavior and electrical properties of excitable tissues. Quantitative as well as conceptual aspects will be emphasized. Prerequisites: 305 and 405 or Veterinary Physiology 420, 421, or Cellular Physiology (Biological Sciences) 371 or equivalent and instructor's consent.

430—Cardiovascular Physiology (3). Important aspects of the cardiovascular system, with emphasis on recent developments. Prerequisite: Physiology 305 and 405 or Veterinary Physiology 420 and 421 or equivalent and instructor's consent.

435—Microvascular Circulatory Function (3). (Same as Veterinary Biomedical Sciences 425.) An in-depth study of microcirculatory structure and function in various tissues with emphasis on recent developments in the understanding of the mechanisms involved in nutrient supply, edema formation, lymphatic function and fluid balance. Prerequisite: Veterinary Physiology 420 and 421 or Physiology 305 and 405 or equivalent and instructor's consent.

439—Renal Physiology (2). Mechanisms in mammalian

renal physiology presented with particular emphasis on current techniques and concepts. Prerequisites: Physiology 305 and 405, or Veterinary Physiology Physiology 420 and 421 (or equivalent) and instructor's consent.

450—Research (1-99.9). Opportunities for research in physiology not leading to dissertation.

490—Research (1-99.9). Research in physiology, leading to dissertation. Graded on a S/U basis only.

Physiology Area Program

The physiology area graduate program resides within the Department of Veterinary Biomedical Sciences in the College of Veterinary Medicine. The requirements for this degree program are described under **Doctoral Degree** for the **Department of Veterinary Biomedical Sciences**.

Plant Pathology

College of Agriculture, Food and Natural Resources
108 Waters Hall (573) 882-2643 or (573) 882-2418

FACULTY

James T. English, department chairman, associate professor, PhD, University of Florida.

Arthur L. Karr Jr., director of graduate studies, associate professor, PhD, University of Colorado.

Merton F. Brown Jr., professor emeritus, PhD, University of Iowa.

Robert Goodman, professor emeritus, PhD, University of Missouri-Columbia.

Anton Novacky, professor emeritus, PhD, Czechoslovak Academy of Science.

Thomas D. Wyllie, professor emeritus, PhD, University of Minnesota.

Johann Bruhn, research associate professor, PhD, University of California-Berkeley.

Arun K. Chatterjee, professor, PhD, University of Guelph.

Patricia Donald, research assistant professor, PhD, North Dakota State University.

Jeanne Erickson, research associate professor, PhD, University of Michigan.

Jeanne D. Mihail, associate professor, PhD, University of Arizona.

Terry L. Niblack, associate professor, PhD, University of Georgia.

James E. Schoelz, associate professor, PhD, University of Kentucky.

Om P. Sehgal, professor, PhD, University of Wisconsin.

Wm. H. Shaffer, research assistant professor, MS, University of Missouri-Columbia.

George Smith, coordinator-Integrated Pest Management Program, research assistant professor, PhD, University of Georgia.

Laura Sweets, research assistant professor, PhD, University of Minnesota.

J. A. Wrather, professor, PhD, University of Missouri-Columbia.

DEGREE: MS and PhD in plant pathology

The following areas of concentration in plant pathology are offered: molecular genetics, phytobacteriology, biochemistry of plant pathogenic fungi, ecology of soilborne plant pathogenic fungi, plant pathogenic viruses and plant nematology.

Plant pathology also cooperates with the departments of agronomy, entomology and horticulture in offering a curriculum in plant pest management. This curriculum is designed to prepare professionals for fields related to protection of the plant and its environment.

Stipends are available from the Agricultural Experiment Station, grants and industry funds. ***For information and application forms, write the Director of Graduate Studies in Plant Pathology, 108 Waters Hall, Columbia, MO 65211.***

GRADUATE DEGREES: To be accepted for advisement to the MS or PhD programs, an applicant should have a BS degree, which includes at least 15 hours of biological sciences and a minimum GPA of 3.0 (A=4.0) on the last 60 hours of the undergraduate curriculum.

There is no language requirement. For graduation, a cumulative GPA of 3.0 or better is required, with no more than two grades of C or lower allowed in courses taken for the graduate degree.

COURSES

205—Forest Pathology (3). (same as Forestry, Fisheries & Wildlife 205). Provides basic understanding of biotic and abiotic agents which cause forest diseases, and current approaches to disease control. Prerequisite: minimum of 5 hours Biology or equivalent. w.

207—Biology of Fungi (3). (same as Biological Sciences 207). The diverse roles of fungi in the biosphere will be explored by considering fungi we eat, fungi which destroy our food, fungi in folklore and fungi as global nutrient recyclers. Prerequisites: Biology 10, 11, or 12 or equivalent. w.

300—Problems (3). Special problem in plant pathology designed for the minor program in Plant Pathology. Problems arranged on an individual student basis.

305—Theory and Concepts of Plant Pathology (3). (same as Forestry, Fisheries & Wildlife 305 and Pest Management 305). To provide information on disease development in plant populations; possible control strategies combined with training in retrieving and critically reviewing research information. Prerequisites: 5 hours Biology, junior, senior or graduate standing. f.

306—Introductory Plant Pathology Laboratory (2). Complements 305 through laboratory study of pathogens, disease and life cycles, diagnosis, and method of disease control for agronomic, ornamental and woody plants. Prerequisites: 305 or concurrently. f.

320—Environmental Microbiology (3). Fundamental knowledge of selected microbial processes that are important in agriculture, environmental detoxification, and microbial biotechnology. Emphasis is on molecular, genrtic and physiological aspects of nitrogen metabolism, bioconversions, antibiosis and biocontrol.

350—Readings in Plant Pathology (1-9). Independent readings and discussion of recent research publications. Topics selected in consultation with supervisory faculty member. Prerequisite: instructor's consent. f,w.

361—Insects in Relation to Plant Diseases (3). (same as Entomology 361). Ecology, behavior, physiology and molecular biology of insect transmission of plant pathogens. Lectures and discussion. Prerequisites: Plant Pathology 305 or 405 and Entomology 208, or instructor's consent. w, odd.

400—Problems (1-99.9). Advanced individual studies; minor research problems. Prerequisite: graduate standing.

401—Topics (1-99.9). Specialized topics in advanced plant pathology not available through regularly offered courses.

402—Plant Pathology Practicum (1-2). Acquaints the student with diseases of important crop plants and with the inciting agents. Emphasis is placed on hands-on diagnosis in a Plant Disease Clinic environment. first half fall, last half winter, summer.

405—Prokaryotic and Viral Plant Pathogens (4). Detailed study of bacterial and viral plant pathogens; their biology, structure, morphology, and host-pathogen interactions. Prerequisites: 305 and three hours biology or the equivalent. w. even yrs.

409—Eukaryotic Plant Pathogens (4). Detailed study of diseases caused by plant parasitic fungi and nematodes. The biology, morphology, and pathology of these pathogens will be integrated into biologically and economically feasible control measures. Prerequisites: 305 and 306.

410—Seminar (1). Presentation, discussion of extension studies, literature. f,w.

411—Biochemistry and Physiology of Plant Diseases (3). Physiology of infectious plant diseases; physical/chemical plant surface interactions between host/pathogen in rhizosphere, metabolic alterations within host/pathogen. Prerequisites: Plant Pathology 305, 320; Biochemistry 270; Biological Science 313. w, even years.

412—Advanced Research Experimentation (4). In-depth laboratory experience designed to familiarize the the student with contemporary research techniques in plant pathology. Prerequisites: Plant Pathology 305, 306, 320, and instructor's consent. w, odd years.

416—Transport and Metabolism of Plant Nutrients (3). (same as Plant Science 416). Current concepts in ion transport across plant membranes and translocation of nutrients in the plant; nitrogen fixation and the function of plant nutrients; and stress caused by imbalance of mineral elements and/or pathogens. Prerequisites: Biological Sciences 313 or Agronomy 315 and Biochemistry 270 and 272. alt. f. odd yrs.

423—Quantitative Ecology of Plant Disease (3). Introduction to the ecological concepts and quantitative tools necessary to examine plant disease epidemics as dynamic systems. Prerequisite: Plant Pathology 305,306,307. alt years w.

435—Genetics of Plant-Microorganism Interaction (3). Molecular and general genetics of the interactions between plants and pathogenic or symbiotic microorganisms. Prerequisites: Plant Pathology 305 and 306, one course each in Biochemistry and Genetics. w, even years.

450—Research (1-99.9). Research not expected to terminate in dissertation.

452—Cell and Molecular Electron Microscopy (4). (same as Veterinary Pathobiology 452). Provides extensive exposure to principles of TEM, instrumentation, and techniques employed in biological research. Prerequisites: graduate standing and instructor's consent. w.

453—Scanning Electron Microscopy (3). (same as Veterinary Pathobiology 453). Provides basic principles and extensive exposure to instrumentation and procedure for scanning microscopy of biological materials. Prerequisites: graduate standing and instructor's consent. f.

490—Research (1-99.9). Independent investigation in field of plant pathology to be presented as a thesis. Graded on a S/U basis only

Political Science

College of Arts and Science
113 Professional Building (573) 882-2062

FACULTY

Dean Yarwood, chair, professor, PhD, University of Illinois. Public administration, politics of

bureaucracy (executive branch communications).

James Endersby, director of graduate studies, associate professor, PhD, University of Texas-Austin. American politics (voting, elections and public opinion), formal or positive theory, methodology.

Ronald Bunn, professor, PhD, Duke University. Comparative politics (Germany), public law and judicial politics.

Donald O. Granberg, adjunct professor, PhD, Pennsylvania State University. Public opinion and communication.

K.C. Morrison, professor, PhD, University of Wisconsin-Madison. Afro-American politics and culture, comparative politics (Africa).

N. Patrick Peritore, professor, PhD, University of California-Santa Barbara. Normative political theory, comparative politics (Latin America, environmental policy).

Robin A. Remington, professor, PhD, Indiana University. Comparative politics (east-central Europe), post-Communist systems (ethnic politics and party building), European security, politics and the military.

Doh C. Shin, professor, PhD, University of Illinois. Comparative politics (Korea and Asia), quality of life and social indicators.

Herbert K. Tillema, professor, PhD, Harvard University. International relations and world politics, American foreign policy.

Paul Wallace, professor, PhD, University of California-Berkeley. Comparative politics (South Asia), electoral politics and political violence (terrorism).

Betty Houchin Winfield, adjunct professor, PhD, University of Washington. Political communication, media and the Presidency.

David M. Wood, professor, PhD, University of Illinois. Comparative politics (western Europe and European community), legislative politics and elections.

Thad Brown, associate professor, PhD, University of Michigan. Formal or positive theory, methodology, electoral behavior and public opinion.

Gregory Casey, associate professor, PhD, Georgetown University. American government and politics, public law and judicial politics.

Tracey George, adjunct associate professor, JD, Stanford University. Law and social science, judicial behavior.

Richard J. Hardy, associate professor, PhD, University of Iowa. American government, federalism and state politics, constitutional law and civil liberties, civic education.

Charles L. Sampson, adjunct associate professor, PhD, University of Pittsburgh. Public administration.

David Webber, associate professor, PhD, Indiana University. Public policy (environment and biotechnology), American government and politics (Congress and state legislatures).

Jay Dow, assistant professor, PhD, University of Texas-Austin. American politics (voting and elections), formal or positive theory, methodology.

Corinna-Barbara Francis, assistant professor, PhD, Columbia University. Comparative politics (China), East Asian politics, political economy.

Valerie Heitshusen, assistant professor, PhD, Stanford University. American politics, interest groups, legislative politics, elections.

Joseph Hewitt, assistant professor, PhD, University of Maryland. International relations, international conflict and crisis bargaining.

Catherine Holland, assistant professor, PhD, New School for Social Research. Political theory, feminist theory.

Lael Keiser, assistant professor, PhD, University of Wisconsin-Milwaukee. Public policy and American institutions.

Sharon Wright, assistant professor, PhD, University of Tennessee. African-American politics, American government.

Garry Young, assistant professor, PhD, Rice University. American politics, legislative and executive politics, state government, formal methods.

DEGREES: MA and PhD in political science

Alumni with PhDs have received teaching appointments at public and private colleges as well as positions of responsibility in state and national government in the United States and in many foreign countries. In recent years, an average of five students a year entered the PhD job market. Eighty percent of the PhD graduates in the past five years became college teachers, 20 percent went into the public service. Six departmental alumni have become college presidents.

The department emphasizes top-quality teaching and research. Several faculty have received awards and prizes for teaching excellence and research.

The department aims to train people as experts in political science and governmental knowledge, while encouraging students to acquire a sufficient background in other disciplines to enable them to correlate their specialized knowledge with all aspects of modern life. The MA degree is intended to prepare students for teaching at the junior-college level, to serve as a stepping stone toward candidacy for the doctoral degree, or to develop skills in policy analysis to meet qualifications for positions in public service at the national, state or local levels.

Students may apply for departmental fellowships, and teaching and research assistantships, as well as University fellowships and scholarships. Applicants for department and University fellowships must submit GRE general test scores to the department. Yearly, about 20 departmental assistantships offer stipends up to $9,200 and waivers of educational fees.

To apply for research and teaching assistantships and fellowships or for additional information write to the Director of Graduate Studies in Political Science, 113 Professional Building, Columbia, MO 65211.

DEGREE REQUIREMENTS: For acceptance for advanced study in political science an applicant should have an undergraduate major in political science, or at least 12 hours of upper-level course work in political science. A major in another area may be acceptable. An applicant must have a GPA of at least 3.0 (A=4.0) on the last half of the undergraduate course of study, as well as a 3.0 in political science courses. Applicants must take the GRE general test and have the results reported directly to the department's director of graduate studies by the time of application. These are minimal requirements; they do not by themselves guarantee either admission or financial support.

MASTER'S DEGREE: The master of arts degree may be earned by completing either a thesis or non-thesis program. The thesis program requires 24 hours of course work (at least 15 in 400-level courses) and an acceptable thesis for which at least six semester hours of 400-level credit must be earned. The non-thesis program is a 30-hour generalist master of arts. The non-thesis master's program requires a student to take at least 24 hours of course work (at least 15 in 400-level courses) and to write a master's paper (for which three to six hours of credit are given). The MA can serve multiple career goals: community-college teaching, continuation of studies to the PhD or entrance into public service. Students wishing to advance from the master's program to the PhD program at MU must take the thesis option. The generalist MA imposes no specific course requirements, but each candidate must take an upper-level course in each of the five fields of political science: comparative government, international affairs, political theory, American political institutions and behavior, and public administration/public policy. The Department also offers an MA program with an emphasis in Public Policy.

All master's degree programs culminate in a comprehensive oral examination. An MA candidate must maintain a B or higher average. Candidacy will be terminated if a student receives more than six hours of C in political science courses.

DOCTORAL DEGREE: Acceptance for advisement into the PhD program is determined by the graduate committee's consideration of the applicant's performance on the GRE general test, the applicant's academic record and letters of recommendation. Although permitted flexibility in planning, students must have PhD programs that include at least 52 hours of graduate work, exclusive of dissertation research. At the option of the student's doctoral program committee, up to 24 hours of the MA program may be included in the PhD program. A student's program shall include at least 30 hours in graduate seminars (400 and above) distributed among three of the five fields in the political science program including:

- A minimum of 12 seminar hours in the primary (research) field
- A minimum of nine seminar hours in a secondary field supporting the primary field
- A minimum of nine hours in a tertiary field.

Besides the above seminar credits in political science, the following are required:

- A minimum of 16 hours in a required research tool field
- A minimum of six hours in an outside field. These courses may be in either a cognate field in support of relevant substantive fields, or research methods or advanced foreign language training related to dissertation research.

The PhD usually requires five years full time or the equivalent in part-time work beyond the bachelor's degree and four years beyond the master's degree. The difference between the minimum 52 semester hours the department requires and the 72 hours (beyond the bachelor's degree) required by the Graduate School is normally composed of hours credited from the master's program and courses devoted to preparation for comprehensive examinations (480) and dissertation research (490).

Besides completing the necessary course

work, the candidate must demonstrate the capacity to use a research tool (such as a foreign language or statistics), should obtain some teaching experience in political science, must pass a written and oral comprehensive examination and must submit and defend a dissertation.

COURSES

201—Topics (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

250—Black Women in American Politics (3). (same as Black Studies 250). Analyzes the role that Black Women have played in American politics from the Reconstruction era's civil rights and women's movements, and bids for elective official. Prerequisites: Political Science 1 or 11 and sophomore standing.

260—Black Political Thought (3). (same as Black Studies 260). Analyzes the major political theories and their proponents from the Reconstruction era to the present. Prerequisite: Political Science 1 or 11 and sophomore standing.

261—American Political Thought (3). Examines major themes that shaped three centuries of American political thought, including slavery, religion, and the tension between unity and difference. Readings are drawn from primary sources (Jefferson, Adams, Mason, Tocqueville, Calhoun, Lincoln, Stowe, Baldwin) as well as contemporary analytic commentary on those sources (Bercovitch, Hartz, Wolin, Guinier, Morrison). Prerequisite: sophomore standing.

265—Bodies, Identities, Politics (3). (same as Women Studies 265). Introduces students to foundational premises of liberal political thought through examination of the dispute between Locke and Filmer. Analyzes subsequent rethinking of that debate in works by Rousseau, Wollstonecraft, nineteenth-century American slaves, contemporary feminists, and communitarians. Prerequisite: sophomore standing.

274—Terrorism: Religious, Ethnic and Ideological Politics (3). Terrorism as political violence extending beyond the acts themselves. Examines major modern movements, e.g. Northern Ireland, Basques (Spain), Germany, Algeria, Arab-Israeli, Iran, India, Sri Lanka, Peru, Argentina, Uruguay. Prerequisite: sophomore standing.

286—Race, Ethics, and Gender in International Relations (3). (same as Peace Studies 286). Explores topics often neglected in the study of international relations, including racism, the laws and ethics of warfare, human rights, and gender. Prerequisite: Political Science 55 or Peace Studies 50, or instructor's consent.

298—Honors (1-6). Special readings, reports in the several fields of political science. For political science Honors students.

300—Special Problems (1-99). Independent investigation to meet needs of the individual student. Prerequisite: instructor's consent.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit vary from semester to semester. Prerequisite: junior standing and instructor's consent. Departmental consent for repetition.

302—Computing Methods (1). Develops computer-based skills with political science data. SAS, and other packages used in mainframe and PC environments. Prerequisite: concurrent enrollment in 326. S/U graded only.

303—Politics and War (3). (same as Peace Studies 303). Why do wars occur? The functions of force and uses of a threat of force. Problems of national security strategy and arms control.

304—Politics of International Economic Relations (3). Study of reciprocal interaction between global politics and economics. Includes politics of north/south relations, multinational non-state actors, arms transfers and dependency. Prerequisites: Economics 5 and junior standing.

305—Political Parties and Election Campaigns (3). Development, organization, functions, activities of major and minor political parties; principles and procedures of managing campaigns; campaign finance; election administration. Prerequisites: 1 or 11, junior standing.

306—Local Government (3). Politics and government of urban and rural areas in Missouri and other states. Includes municipalities, counties, and special districts; political organization and urban problems. Prerequisites: 1 or 11, junior standing.

310—Introduction to Public Administration (3). Surveys recurring themes, conceptual problems, and substantive findings in the literature of public administration with particular attention to U.S. public bureaucracies. cor.

311—Politics of Regulatory Policy (3). Role of administrative agencies, Congress, the President and the courts in the development of regulatory policy in the United States. Prerequisite: junior standing.

312—Issues in Public Bureaucracy (3). Investigates selected political and administrative problems affecting public bureaucratic units. Context varies.

314—American Foreign Policies (3). Bases, formulation, evaluation of current American foreign policies. Prerequisite: junior standing.

316—Congress and Legislative Policy (3). Study of national and state legislative systems and legislative policy making, with emphasis on Congress. Prerequisites: 1 or 11. cor.

317—Public Policy (3). Introduction to the study of public policy in the United States. Analyzes public policy choices at the national, state and local level and the variety of forces which serve to shape policy decisions. Prerequisite: junior standing.

318—Comparative State Politics (3). Analyzes similarities and differences of state politics and the ways in which such politics are shaped by political and socioeconomic environments of the states.

319—Policy Analysis (3). Approaches to designing public policies including cost-benefit accounting, decision theory, and programming. Investigation of formulation of policy objectives with special emphasis on problems of collective choice and rationales for market intervention.

320—The American Constitution (3). Leading American constitutional principles as they have evolved through important decisions of the United States Supreme Court. Prerequisites: 1 or 11; junior standing. cor.

321—The Constitution and Civil Rights (3). Civil rights in the American constitutional context emphasizing citizenship, voting rights, purposeful and structural discrimination (age, race, sex, physical), and legal remedies (equal opportunity, affirmative action). Prerequisites: junior standing; Political Science 1 or 11.

324—Survey Research Methods (3). Selection of survey research topics, questionnaire development, sampling, interviewing, coding and preparation of data for computer analysis. Emphasis on practical participation.

325—Interest Groups (3). Development, organization, functions, activities, internal politics of special interest groups such as business, labor, agricultural and public interest groups; lobbying and techniques for influencing public policy in the American political system. Prerequisite: 1 or 11, junior standing.

326—Introductory Statistics for Political Science (3). Basic course in applied statistics and inference using extensive examples from voting behavior, congressional behavior, international relations and public policy. Topics included nonparametric measures, probability, and rudimentary hypothesis testing; computer applications with political data using SAS. Prerequisites: Math 10 or equivalent, concurrent enrollment in PS 302.

327—Mathematical Modeling in Political Science (3). Introductory course in formal mathematical models of political behavior and political institutions. Topics includes electoral rules, agenda control, measures of power, collective action, constitutions. Prerequisites: Math 10 or equivalent.

328—Political Behavior (3). Economic, psychological, and social dimensions of political behavior; participation, leadership and elites; political attitudes; voting behavior and decision-making processes. Prerequisites: 1 or 11; junior standing.

329—Constitution and Civil Liberties (3). Civil liberties in the American constitutional context emphasizing freedom of expression (religion, speech, press, assembly), rights of accused and right to privacy. Prerequisites: junior standing; Policital Science 1 or 11.

331—Issues in Public Policy (3). Investigates selected public policies on an intensive basis. Policy issues vary. Prerequisites: junior standing.

332—Administrative Agency Internship (3-6). Work experience with government agency at local, state, or national level. S/U grade only. Prerequisite: junior standing with at least 2.5 GPA or senior in good standing; 102, 306 or 310.

333—Legislative Internship (3-6). Weekly work experience with an assigned individual legislator in Jefferson City during regular session of state legislature, coordinated by faculty member. S/U grade only. Prerequisite: junior standing with at least 2.5 GPA or senior in good standing. 102 or 316 previously or simultaneously.

334—Campaign Internship (3-6). Participation in political campaigns with coordination by faculty member. S/U grade only. Prerequisites: 305 previously or simultaneously, junior standing with at least 2.5 GPA or senior in good standing.

335—Lobbying Internship (3-6). Weekly work experience with an assigned lobbyist or lobbying group in Jefferson City during regular session of state legislature, coordinated by faculty member. S/U grade only. Prerequisites: 325, junior standing with at least 2.5 GPA or senior in good standing.

336—Special Internship (3-6). Competitive internships in Jefferson City with interns selected by political science department. Coordinated by faculty members. S/U grade only. Prerequisite: junior standing with at least 2.5 GPA or senior in good standing.

340—The American Presidency (3). Evolution of the presidency; particular emphasis on constitutional and political roles played by chief executive in shaping public policy. Prerequisites: 1 or 11; junior standing.

341—Women and the Law (3). (same as Women Studies 341). Focus on legal issues which are relevant to women such as divorce, domestic violence, employment discrimination, pregnancy discrimination, rape, sexual harassment, and others. In addition, students will gain preparation for graduate or law study by analyzing cases, concepts and terms. Requires an extensive amount of reading and writing. Prerequisite: 1 or 11 and junior standing.

350—Special Readings (1-99). Independent readings selected in consultation with supervisory faculty member. Prerequisite: instructor's consent.

351—Latin American Governments (3). Development, present status of political institutions in South America; emphasizes current political problems. Prerequisites: 1 or 11; junior standing.

353—Germany and European Security (3). Focuses on the factors, both internal and external to Germany, that are likely to shape the policies and goals which Germany will advance in the foreseeable future as a major participant in European affairs. Prerequisite: 1 or 11 and junior standing.

354—Western European Political Systems (3). Comparison of political cultures, institutions, and processes of Britain, France, West Germany, and selected smaller countries in Western Europe. Prerequisite: junior standing.

355—Western European Foreign Policy (3). (same as Peace Studies 355). Comparison of foreign policies of the major Western European countries; their roles within the European community. Study of institutions and functioning of the European community and its potential as an emerging

world power. Prerequisite: junior standing.

356—Post Communist Europe (3). Investigates causes and consequences of the revolution of 1989-90 for Post-Cold War Communist East Central Europe. Emphasis on the clash between demands for national self- determination and the imperatives of economic reforms. Prerequisite: junior standing.

358—Russian Foreign Policy (3). Principles, problems, and evolution of foreign policy of post-Soviet Russia towards other Soviet successor states, Western nations, East Central Europe, Asia, and the developing world. Prerequisite: junior standing.

362—Classical Political Theory (3). Great Greek, Roman, and Medieval political theorists on the relation of psychology, ethics, politics, and the best form of government. Prerequisite: junior standing or instructor's consent.

363—Modern Political Theory (3). Great political theorists from Machiaveilli through Marx on the nation state, capitalism, liberalism, conservatism, and Marxism. Prerequisite: junior standing or instructor's consent.

364—Contemporary Political Theory (3). Great contemporary thinkers on Western vs. Eastern Marxism, existentialism, critical theory, political theologies, postmodernism, feminism, environmentalist ideolgies, biological approaches to politics. Prerequisite: junior standing

365—Environmental Theory and Politics (3). Introduction to ecology and human impacts/extinction, climate change, pollution. Responses to the crisis in terms of environmental economics, comparative regulatory policy and law, postmodern environmentalist ideologies, and international treaty regimes. Prerequisite: junior standing or instructor's consent.

366—Feminist Political Thought (3). (same as Women Studies 366). This course examines the deployment of sexual difference in selected canonical works of the western political tradition, and it introduces students to important debates within contemporary feminist thought about the relationship between feminism and politics. Prerequisite: junior standing.

370—Political Development and Social Change (3). (same as Peace Studies 370). Interdisciplinary analysis of the dynamics of political and socioeconomic change based on an examination of theories of development and case studies from Asia, Africa, Latin America, and /or the Middle East.

371—Third World Politics (3). (same as Black Studies 371). Comparative, interdisciplinary analysis of the politics of selected states in Southeast Asia, Africa, and Latin America. Special attention given to the problems of political and socioeconomic development. Prerequisites: junior standing or instructor's consent.

374—Politics in India and South Asia (3). (same as South Asia Studies 374). Contemporary political and governmental patterns of India, Pakistan, Sri Lanka, Nepal, and Bangladesh.

375—The Politics of Modernization: East Asia (3). Comparative study of the evolution of national governments and policies, primarily in Japan and Korea, sometimes China. Prerequisite: junior standing.

376—Contemporary Chinese Politics (3). Comparative study of the evolution of national governments and policies in China and Taiwan.

384—International Problems in the Middle East (3). (same as Peace Studies 384). Nature and causes of the Arab-Israeli Conflict, inter-Arab rivalries, the Persian Gulf Problems, and the involvement of external powers in these conflicts. Prerequisites: junior standing.

385—International Organization (3). Forms and functions of governmental (United Nations, European Union, NATO) and nongovernmental international organizations. Prerequisites: junior standing; 1 or 11.

386—Theories of International Relations (3). Surveys Theories of International Relations. Analyzes conceptions of decision-making, foreign policy behavior and international society. Prerequisite: junior standing

387—The European Union in the Global System (3). Provides an understanding of the European Union from the perspective of international relations and comparative politics. Topics covered pertain to the institutions, politics and policies of the European Union and its member states. Prerequisites: 1 or 11 or 55 and junior standing.

390—Political Science Capstone (3). Readings and discussions in selected areas of political science (comparative, American, international affairs, public administration/policy or theory). Subject depends on instructor. Prerequisites: political science major, senior standing.

400—Problems (1-99). For graduate students with necessary prerequisite courses. Topics in one of the fields of political science for individual study.

401—Topics (1-99). Organized study of selected topics. Subjects and earnable credit vary from semester to semester. Prerequisites: instructor's consent, departmental consent for repetition.

402—Readings in International Relations (3). Analysis, evaluation of some basic theories which attempt to explain international affairs.

404—Seminar in International Politics (3). Intensive study of foreign policy formulation and implementation; special emphasis on American foreign policies.

405—Readings in American Politics (3). Critical examination of literature in American politics. Focus varies.

406—Research in American Politics (3). Directed research into one or more specific aspects of American politics, including Congress, parties, elections, interest groups, public opinion, the presidency.

407—Problems in Public Opinion (3). Intensive study of public opinion theory and analysis.

410—Readings in Public Administration (3). Critical examination of literature relating to selected topics in public bureaucracies.

411—Research in Public Administration and Public Policy (3). Directed research in Public Administration or Public Policy. Inquire as to the emphasis for any given semester.

418—Federalism and Intergovernmental Relations (3). Analyzes relationships among American governmental units emphasizing national-state relations and metropolitan area problems. Prerequisite: instructor's consent.

420—Judicial Behavior (3). Critical examination, both conceptual and methodological, and behavioral literature in public law. Emphasizes impact of judicial decisions and relations of judiciaries to their environments.

423—Readings in International Political Economy (3). This graduate seminar covers topics in theories of political economy and current problems like the North-South relations, international trade, monetary relations, aid regimes, and international division of labor.

430—Seminar in Public Policy (3). Covers the basic theory, approaches, problems and issues relating to the scope, development and implementation of public policy.

431—Policy Evaluation Methods (3). Methods of evaluating the impact of public policies. Emphasis on applied designs such as sampling design, experimental design, statistical regression and evaluation research. Prerequisite: 326 or equivalent.

432—Seminar in Regulatory Policy (3). Intensive study of theories of policy formation, implementation and evaluation of regulatory policy. Topics may include, but not be limited to, policy concerning the environment, food and drugs, telecommunications, worker safety and health, and biological reproduction.

440—Research Design and Analysis (3). Research design, social measurement and statistical analysis for study of political phenomena. Prerequisites: instructor's consent.

441—Inference and Political Statistics (3). Point and interval estimation and statistical hypothesis testing with applications to political research. Data and examples drawn mostly from electoral behavior, conflict theory, international relations and public policy. Primarily for political science students. Prerequisite: 326 or equivalent with instructor's consent.

442—Linear Models in Politics (3). Linear and non-linear multivariate estimation techniques with applications to political science research. Prerequisite: 326 or equivalent with instructor's consent.

443—Advanced Political Methodology (3). Analytic strategies and statistical models applicable to social science research. Emphasis on modeling political phenomena. Topics vary, include linear and nonlinear models, multidimensional scaling. Prerequisites: 441, 442 or equivalent.

444—Introduction to Formal Political Theory (3). Formal and mathematical models of political institutions and behavior. Topics may include social choice, game theory, spatial models, coalition formation. Prerequisite: 326 or equivalent with instructor's consent.

448—Scope and Methods (3). Examines the major fields in the discipline, assumptions underlying empirical social science and theoretical issues in the study of politics. Primarily for doctoral candidates in political science. Prerequisite: instructor's consent.

449—Leadership in Civic Education (3). Intensive workshop for Missouri secondary social studies teachers. Includes instructional materials on U.S. and Missouri governments, lectures by leading scholars, breakout sessions, and interactions with government practitioners. s.

450—Research (1-99). Independent research not leading to thesis.

452—Research in the Politics of Industrial Societies (3). Comparative analysis of public policy in Western democracies. Emphasis on economic policy and related policy areas. Comparisons of Western European countries with United States, Japan, USSR when appropriate.

456—Seminar in Comparative Politics (3). Comparative study of selected aspects of political systems. Variable content. May be repeated for credit.

459—Readings in Comparative Politics (3). Study of theories and approaches to comparative politics in Europe, Asia and/or Latin America.

460—Seminar in Classical Political Theory (3). Intensive analysis of great classical and medieval thinkers: Pre-Socratics through the Two Swords controversy. Course covers primary sources, critical works, sociohistorical background of the ideas, their contemporary relevance.

461—Seminar in Modern Political Theory (3). Intensive analysis of great modern theorists from Machiavelli to Mill. Course covers classical texts, criticism, sociohistorical background, and contemporary relevance of ideas.

462—Seminar in Contemporary Politcal Theory (3). Twentieth-century Marxism, existentialism, critical theory, postmodernism, environmental thought, liberation theology, biological approaches. Primary readings and critical literature.

463—Selected Themes in Political Thought (3). Intensive examination of selected themes and problems in political thought. Themes may include: feminist political thought, perspectives on politics and violence, nationalism and post-colonial thought, or political theory and political culture.

464—Comparative Social Science Methodology (3). Critique of logic, methods, definitions of social reality in positivism, neokantianism, pragmatism, structuralism dialectical methodolgies, postmodernism, evolutionary biology, complexity theory, as approaches to social and political phenomena.

472—Political Economy of Rural Development in the Third World (3). Interdisciplinary, comparative analysis of political aspects of rural development in the Third World.

475—Seminar in East Asian Politics (3). Intensive study of selected topics in the internal and external politics of China, Japan and Korea. Prerequisites: graduate standing or

instructor's consent.
480—Independent Readings for Ph.D. Comprehensive Examinations (1-6). Graded on S/U basis only.
490—Research (1-99). Independent research leading to thesis. Graded on a S/U basis only.

Practical Arts and Vocational-Technical Education

See Curriculum and Instruction

Psychological Statistics and Methods (Minor)

College of Arts and Science
16 McAlester Hall (573) 882-3360

FACULTY

Phillip Wood, coordinator, associate professor of psychology, PhD, University of Minnesota.
Asit P. Basu, professor of statistics, PhD, University of Minnesota.
Harris M. Cooper, professor of psychology, PhD, University of Connecticut.
John E. Hewett, professor of statistics, PhD, University of Iowa.
Paul L. Speckman, professor of statistics, PhD, University of California-Los Angeles.
Julian F. Thayer, associate professor of psychology, PhD, New York University.

The minor, offered through the cooperation of the departments of psychology and statistics, is designed to acquaint students with state-of-the-art statistical and methodological procedures, give students the skills to handle complex problems in data analysis and research design, and prepare students to teach elementary and advanced courses in psychological statistics and methods.

DOCTORAL MINOR: The minor is open to PhD students in any department. A total of seven courses in statistics and methods is required. Doctoral students in psychology or statistics must take at least two of these seven courses outside their major department. Students electing the minor from departments other than psychology or statistics must take five courses within these two departments, at least two of which are in statistics and two in psychology. All courses must be at the 300 or 400 level. Specific procedures and requirements vary by major department.

A student formally requesting admission to the minor, also will request a minor-area adviser who is a consenting member of the Psychological Statistics and Methods Coordinating Committee. Together, the student and adviser will complete a minor plan of study outlining the courses to be taken and the schedule for their completion. The minor plan of study must be approved by the committee of coordinating faculty. This plan will then be countersigned by the student's major faculty adviser. It is the responsibility of the student to inform both advisers of any changes in the plan or failure to meet requirements.

Students interested in learning more about this minor should write or call the coordinator, 16 McAlester Hall, Columbia, MO 65211, (573) 882-3360.

Psychology

College of Arts and Science
210 McAlester Hall (573) 882-6860
http://www.missouri.edu/~psyweb

FACULTY

Thomas M. DiLorenzo, chair, professor, PhD, West Virginia University. Health psychology/behavioral medicine; assessment and treatment of addictive behaviors.
Dennis Wright, associate professor, director of graduate studies, PhD, University of California-Berkeley. Neuroscience; memory; recovery of function; reactive synaptogenesis; psychopharmacology-toxicology-teratology.
Craig A. Anderson, professor, PhD, Stanford University. Aggression; attribution theory; social judgment; belief perseverance; personality-social interface.
Wayne P. Anderson, professor emeritus, PhD, University of Missouri-Columbia.
Bruce J. Biddle, professor, PhD, University of Michigan. Role theory; social psychology of education; mathematical models of social behavior.
Charles M. Borduin, professor, PhD, Memphis State University. Family interaction; family therapy process and outcome; social policy issues in children's mental health services; child development.
Harris M. Cooper, professor, PhD, University of Connecticut. Literature reviewing, social psychology of education; research methods.
Nelson Cowan, professor, PhD, University of Wisconsin. Auditory and speech perception; short term memory and attention in adults and children.
Robert H. Dolliver, professor, PhD, The Ohio State University. Personality theory, psychotherapy; unstructured groups.
David Geary, professor, PhD, University of California-Riverside. Development of numerical and spatial cognition; mathematical learning disabilities; information-processing models of cognitive arithmetic; cross-cultural differences in mathematical development; evolutionary psychology; cognitive sex differences.
Russell G. Geen, professor, PhD, University of Wisconsin. Motivation; aggression; social anxiety; historical and theoretical issues.
Joseph LoPiccolo, professor, PhD, Yale University. Diagnosis and treatment of sexual dysfunction and sexual deviation; treatment of victims of sexual assault; forensic evaluations of sexual offenders.
David G. McDonald, professor, PhD, Washington University. Health and cognition; physiological correlates of behavior.
Lizette Peterson-Homer, professor, PhD, University of Utah. Children and families; enhancing parenting techniques in at-risk families; general pediatric psychology; emphasis on chronic illness, pain, elective surgery.
Kenneth J. Sher, professor, PhD, Indiana University. Alcoholism; anxiety; anxiety disorders.
Mark H. Thelen, professor, PhD, Michigan State University. Eating disorders in children and adults; child sexual abuse; intimate relationships, especially with reference to expectancies, attribution, and anxiety; emotions in children and adults; social learning; ethical and other professional issues.
Debora Bell-Dolan, associate professor, PhD, West Virginia University. Child psychopathology; social and socializing behavior of children with internalizing disorders; children's peer relations.
Ann Bettencourt, associate professor, PhD, University of Southern California. Intergroup process; ethnic and gender prejudice, stereotyping and interpersonal relations.
M. Lynne Cooper, associate professor, PhD, University of California-Santa Cruz. Alcohol abuse, alcoholism and behavior; risk behavior; stress, coping, and health; sexual assault and education; family planning.
David DuBois, associate professor, PhD, University of Illinois at Urbana-Champaign. Child and adolescent development psychopathology — emphasis on role of self-system processes and socioenvironmental factors.
Steven A. Hackley, associate professor, PhD, University of Wisconsin. Cognitive and clinical neuroscience; human electrophysiology; attention and performance.
Todd R. Schachtman, associate professor, PhD, State University of New York-Binghamton. Animal learning, memory and conditioning; human contingency developments; stress, conditioning and health; animal behavior.
Michael A. Stadler, associate professor, PhD, Purdue University. Cognitive psychology; human learning and memory; attention; implicit learning.
Julian Thayer, associate professor, PhD, New York University. Neural control of cardiovascular systems; psychopathology of emotions; alcohol and drug use in ethnic minorities; nonlinear dynamic systems approaches to biobehavior.
Timothy Trull, associate professor, PhD, University of Kentucky. Diagnosis of psychopathology, particularly personality disorders; personality assessment for psychopathology.
Phillip Wood, associate professor, PhD, University of Minnesota. Statistical methodologies and cognitive development processes, ill-structured problem solving; assessment of goals of higher education.
Jamie Arndt, assistant professor, PhD, University of Arizona. Social psychology; motivation, terror management.
Monica Fabiani, assistant professor, PhD, University of Illinois. Cognitive neuroscience, memory, aging, brain imaging (event-related brain potentials and fast optical imaging).
Gabriele Gratton, assistant professor, MD, University of Rome, PhD, University of Illinois. Cognitive neuroscience hemispheric organization; sensory memory, attention; organization of mental processes; brain imaging and electrophysiology.
Jana Iverson, assistant professor, PhD, University of Chicago. Developmental psychology; cognitive development; language and communication.
Jonathan W. King, assistant professor, PhD, Carnegie Mellon University. Cognitive neuroscience, language processing, working memory, eye movements; analysis of psychophysiological data; brain imaging.
Jennifer Krull, assistant professor, PhD, Arizona State University. Quantitative psychology; multilevel modeling; research methods in prevention.
Amanda Rose, assistant professor, PhD, University of Illinois. Developmental psychology; social

development; friendship and peer relations in children.

Jeff Rouder, assistant professor, PhD, University of California-Irvine. Mathematical and statistical models of perception, attention and memory.

Wendy S. Slutske, assistant professor, PhD, University of Minnesota. Etiology and classification of externalizing psychopathology including conduct disorder, antisocial personality disorder, alcoholism and substance abuse using behavioral genetic and epidemiologic methods to examine genetic and environmental risk and protective factors for externalizing psychopathology.

DEGREES: MA and PhD in psychology, with emphasis areas in clinical psychology, cognition and neuroscience, developmental psychology, quantitative psychology and social psychology

Clinical Psychology: The clinical psychology program is fully accredited by the American Psychological Association and is a charter member of the Academy of Psychological Clinical Science. The latter membership underscores a commitment to empirical approaches to evaluating the validity and utility of testable hypotheses and to advancing knowledge by this method. The clinical program is coordinated by a director and a committee comprised of faculty members specializing in this area. The program seeks to prepare students for careers in clinical science including research, teaching, and service in universities, medical centers, clinics, hospitals, and similar agencies. In addition to the program's training emphasis on the development of research skills, students also receive training in basic areas of psychology as well as training in empirically supported approaches to assessment, prevention and intervention. The clinical program maintains its own community-based outpatient clinic (the Psychological Services Clinic; PSC) as a practicum training site for students in the clinical program. The PSC is staffed by doctoral-level clinical psychologists, and it provides students with a broad range of experience in a managed care environment. Additional research and clinical experiences, arranged through the department, are available through paid clerkships at institutions such as Fulton State Hospital, Mid-Missouri Mental Health Center, University Hospitals and Clinics, and Rusk Rehabilitation Center.

Cognition and Neuroscience: The PhD program in Cognition and Neuroscience is intended to provide a strong background for a career in research and teaching. Background coursework in statistics, psychology, and brain science is emphasized during the first two years. In addition, students are expected to be continuously engaged in research during the entire period of their graduate training. Research skills are acquired through an apprenticeship program in which students learn by doing. Entering students select and join a research team headed by a faculty member who is an internationally acknowledged expert in his or her field. Collaborative research by the student and his or her adviser typically leads to findings that are presented at conferences and are published in refereed scientific journals.

Graduate students choose a research team based on their own interests and career goals. Among the topics investigated by the different groups are memory, attention, perception, motor control, language, aging, development, neuropsychiatric disorders, and neuroimaging methods. Most of the research teams are supported by grants that provide stipends and training opportunities for graduate students.

Developmental Psychology: The PhD program in developmental psychology is designed to provide students with the background needed for teaching and research at the university level. During the first two years, the student will take basic courses in statistics and various areas in psychology to ensure breadth of training and specific courses in cognitive development, social development, and aging. At the same time, and continuing throughout graduate training, the student will be engaged in research focusing on a basic aspect of human development. Opportunities for collaborative research with faculty in other training areas are available.

Quantitative Psychology: The goal of the graduate program in quantitative psychology is to produce researchers who are able to develop, evaluate and apply advanced methodological techniques to psychological research questions. Given the rapid rate of new developments in quantitative psychology, it is essential that well-trained quantitative psychologists possess the long-term statistical literacy skills afforded by a foundation of coursework in mathematical statistics and probability. For this reason, coursework in the area exposes the student to advanced statistical techniques usually employed in psychology as well as classes offered in the Department of Statistics which deal with mathematical statistics and probability. Additional coursework from other departments, such as linear algebra, computational modeling, and measure theory may be included as appropriate. Current quantitative emphases within the quantitative training area include meta-analytic and secondary analysis techniques, structural equation modeling, particularly as applied to longitudinal models of change and growth, and mathematical models of physiological response. In addition, students trained in the program will have extensive experience as statistical consultants through specific coursework in statistical consultation. Because faculty in this area are often supported by grants, additional training opportunities in methodology and its application are available through research assistantships.

Social Psychology: As do other PhD programs of the psychology department, the social program has a strong research emphasis. The goal is to provide thorough preparation for careers in research, teaching and the service functions of social psychology. Some specialized course work may begin in the first year, with concentrated seminars and other courses coming in the second and third years. Methodological skills are emphasized in training along with theoretical expertise. Attitudes and social cognition, social motivation, aggression, intergroup perceptions and dynamics are among the topics of courses and research. More applied topics include the areas of the social aspects of health and education.

These programs and others are more fully described in brochures available from the department chair. Financial aid is available through departmental research and teaching assistantships and from Graduate School fellowships.

DEGREE REQUIREMENTS: Applicants for advanced degrees in psychology must complete application forms obtainable from the department. There are no rigid requirements, but most students accepted have an undergraduate major in psychology or its equivalent. Acceptance is based on training, quality of work, recommendations, GRE scores and other information. For additional information on admission requirements, consult Graduate Study in Psychology and Associated Fields, published annually by the American Psychological Association and available in most libraries.

Graduate students not accepted by the department may not take psychology courses at the 400 level without the instructor's consent.

MASTER'S DEGREE, THESIS OPTION: Degree requirements for the MA consist of 30 hours of course work, including six to eight hours of research credit for an experimental thesis in publishable form. An oral examination on the thesis is required.

DOCTORAL DEGREE: The PhD qualifying examination requirement is satisfied by successful completion of the department's core curriculum. In addition, a master's degree with an empirical thesis is required for admission to doctoral study. Those entering the department with a master's degree obtained without an empirical thesis may meet the latter requirement by conducting an investigation under the supervision of their adviser.

General requirements for the PhD include 15 hours of core curriculum courses, three courses in statistics and a selection of courses in and out of the main area of concentration and research. Practicum and certain other courses are required for the counseling and clinical programs.

Other requirements include a major review paper, a dissertation and comprehensive and final oral examinations.

COURSES

200—Special Problems (1-99). Research apprenticeship with a faculty member, assisting a faculty member in the development and execution of research. May be repeated to 6 hours maximum. Prerequisite: instructor's consent.

201—Topics (1-99). Organized study of selected topics in psychology. Particular topics and earnable credit may vary from semester to semester. Prerequisite: 1, sophomore standing, and instructor's consent.

202—Normal Language Development (3). (same as Communicative Science & Disorders 202). Language development in preschool and school-age children. Specific attention to congnition and language, developmental sequences, language learning processes, language sample analysis, and the relationship between spoken and written language. Prerequisite: Linguistics 340 (preferred) or instructor's consent.

205—Environmental Psychology (3). Survey of the effects of environmental variables (e.g., temperature, noise, crowding, etc.) on behavior. Some coverage of techniques for

modifying behavior to preserve the environment. Prerequisites: 1.

211—Theories of Learning (3). This course discusses classical issues and theories in learning and conditioning, and considers them in contemporary form. Prerequisite: 5 hours of Psychology (exclusive of Psychology 200).

212—Human Learning (3). Factors affecting human learning, retention; basic principles of learning, forgetting. Prerequisite: 1.

215—Research Methods in Psychology (3). Rationale of scientific research; role of the experiment and other forms of information gathering in psychology; survey of research methods. Prerequisites: 1 and Statistics 31 (Statistics 31 can be taken concurrently).

216—Research Methods in Psychology II (3). Continuation of Psychology 215 and required for all further labs in psychology. Prerequisite: 1 and 215 with grade of C or better and Statistics 31 with a grade of C or better.

220—Introduction to Counseling Psychology (3). Overview of counseling psychology including: history, counseling theories, and issues associated with multiculturalism; gender, and ethical practice. Prerequisite: 1 and sophomore standing.

230—Individual Differences (3). Surveys individual, group differences. Contributions of various factors to variations in behavior. Prerequisite: Statistics 31 with grade of C or better.

240—Cognitive Psychology (3). A survey of psychological theory and research on human cognition. Prerequisite: 1.

250—Health Psychology (3). A hands-on approach to the study of health psychology including research on a topic of current relevance to the field. Cross listed with Honors 210GH. Prerequisite: Psychology 1 and one other psychology course.

279—Human Memory (3). This undergradute survey course introduces research on verbal and nonverbal human memory. The course will include a review of amnesia and life-span memory development, with emphasis on a cognitive neuroscience perspective. Prerequisite: 216 or instructor's consent.

293—Perception & Thought (3). Covers research on various aspects of mental life: language, problem-solving, decision-making, sensory perception, memory, attention, and consciousness. Behavioral and neurophysiological evidence. Prerequisite: 1 and 215.

296—Human Aggression (3). This course examines human aggression from a social psychological perspective. Topics include cognitive, affective, developmental, and biological aspects. The effects of media violence and other societal factors are also examined. Prerequisite: 216 and 190 (or Sociology 260).

300—Special Problems (1-99). Independent investigation leading to a project or paper. Repeatable upon consent of department. Prerequisite: instructor's consent.

301—Topics (1-99). Organized study of selected topics in psychology. Particular topic and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisites: junior standing & instructor's consent.

302—Theories of Personality (3). A survey of human personality theories. Prerequistie: 1.

303—Community Psychology (3). This course examines the theory and practice of community psychology. Topics covered include prevention, self-help/ mutual help, empowerment, consultation, and program evaluation. Prerequisites: junior standing and instructor's consent.

304—Industrial/Organizational Psychology (3). Survey of basic and applied personnel and organizational psychology. Focus on the human relations field, job satisfaction, leadership, group dynamics and formal organizational structures within the realm of industry. Prerequisite: 215.

306—Behavior Genetics (3). The study of genetic influences on behavioral traits such as mood, personality, intelligence, mental health, or activity level. Prerequisite: Psychology 215.

308—Ethical Issues in Psychology (3). Issues and problems in research, service, and public policy: privacy, confidentiality, consent, deception, coercion, exploitation, value convlicts. Extensive writing required. Prerequisite: junior or senior instructor's consent. Letter grading. f.

313—Physiological Psychology (3). Survey of basics of intercellular communication and findings in behavioral neuroscience that apply to topics such as drugs and reward, emotions and stress psychoimmunology, psychopathology, nervous system development and repair, learning and memory. Prerequisite: junior standing.

321—Seminar in Health Psychology (3). A broad overview of health psychology, with special emphasis on psychological theories, methods, and thier applications to health behavior. Prerequisite: 216 and instructor's consent, or graduate standing.

330—Animal Behavior (3). Animal behavior focus combining disciplines of behavior ecology and psychology including topics such as habitat selection, feeding, parenting, mating, communication, learning. Prerequisite: Psychology 1 plus 8 hours of Psychology (exclusive of Psychology 200) or Biology. w.

340—Human Inference and Social Judgement (3). This seminar focuses on social and cognitive research on various judgements under uncertainty. Both person-centered judgements (e.g., attributions) and nonperson-centered judgements (e.g., covariation detection) are included. Prerequisites: 190 and 212 or graduate standing.

344—Group Dynamics and Role Theory (3). (same as Sociology 344). Detailed investigation of one or more theoretical and experimental areas in social psychology. Prerequisites: 190 or instructor's consent.

345—Advanced Abnormal Psychology (3). Intensive survey and evaluation of the psychological literature on abnormal behavior, emphasizes experimental and explanatory approaches. Students may not receive credit for both 180 and 345. Prerequisites: 9 hours of psychology or graduate standing.

347—Emotional Disorders in Childhood and Adolescence (3). Surveys disturbed behavioral development during childhood and adolescence, emphasizing factors that produce deviation from normal developmental patterns. Prerequisites: 170 or equivalent

350—Special Readings (1-99.9). Independent readings selected in consultation with supervisory faculty member. Repeatable upon consent of department. Prerequisite: instructor's consent.

351—Psychology of Women (3). Overview of current theories and research relating to the psychology of women. Topics include gender stereotyping, psychological sex differences, achievement motivation in women, and women and mental health. Prerequisite: 1 and junior standing.

361—The History of Psychology (3). Historical foundations of contemporary psychology. Prerequisites: senior standing and 9 hours Psychology.

365—Introduction to Clinical Psychology (3). Comprehensive survey of the field's historical roots, research methods, concepts of abnormality, assessment and intervention methods: also specialities that constitute clinical psychology. Prerequisites: junior or senior psychology major or graduate standing in related fields.

367—Clinical Psychophysiology (3). Examines electrophysiological approaches to the diagnosis of neurological and psychiatric disorders (e.g., epilepsy, sleep disorders). Prerequisite: junior standing and one previous neuroscience-related course.

371—Attitude Change (3). (same as Sociology 371). Methods, theories, experimental findings in social attitude research. Prerequisite: 1 or 2 and junior standing.

376—Psychological Tests and Measurements (3). Survey of theories and methods of psychological test construction, focusing on measures of intelligence and personality. Lab component involves experimental training in test construction and test evaluation. Prerequisite: 215.

378—Animal Learning Laboratory (3). Survey of principles of animal behavior and animal learning and congnition. The course includes laboratory projects on research in animal behavior and animal learning. Prerequisites: 216 and either 211, 313, or 330.

379—Human Cognition Laboratory (3). Students review, evaluate and conduct research on various aspects of human cognition. Prerequisite: 216 and senior standing.

380—The Human Senses Laboratory (3). Psychophysical data, sense organs, psychological attributes, and theories for vision, hearing, and the vestibular (motion) senses. Elementary aspects of psychophysics. Prerequisite: 216.

385—Experimental Social Psychology (3). Experimental studies of attitudes, social interaction, person perception, and other topics of contemporary social psychology. Prerequisites: 216 and 190.

387—Psychology of Aging (3). Surveys psychological processes in aging during middle/late adulthood. Emphasizes sensory, perceptual, physiological, memory, cognitive processes, and methodological issues in gerontological research. Prerequisites: 1 and 170 recommended.

390—Cognitive Neuroscience (3). The neural basis of human information processing. Memory, attention, perception, imagery, movement, language, dreams. Prerequisites: 216.

393—Perception (3). Data and contemporary theories of perception in all of the senses, with emphasis on visual and auditory perception. Prerequisite: 216.

398—Honors Research Seminar I (1-99). Individual honors thesis on a topic selected with a faculty advisor. Students projects are carried out over the course of two semesters (399 in winter semester). Students should plan on enrollment of both 398 and 399. Weekly class discussions of research topics, strategies and of current issues. Prerequisites: 215 and 216, junior or senior standing, overall and Psychology GPA 3.3 and instructor's consent. Successful completion of thesis and maintenance of 3.3 GPA leads to degree with honors in Psychology.

399—Honors Research Seminar II (1-99). Prerequisite: 398. w.

400—Problems (1-99). Advanced studies to meet needs of individual student. Prerequisites: instructor's consent, departmental consent for repetition. Graded on S/U basis only.

401—Topics (1-99). Organized study of selected topics in psychology. Particular topic and earnable credit may vary from semester to semester. Prerequisites: instructor's consent, departmental consent for repetition.

402—Functional Neuroscience (3). Basic techniques, data and theory in the neurosciences applied to the study of psychopathology, psychopharmacology, neural development, brain damage, memory and other areas of "behavior." Prerequisites: graduate standing or instructor's consent. f.

403—Teaching of Psychology Practicum (1-99). Focuses on development and enhancement of teaching skills for graduate students in psychology who are primary instructors of undergraduate psychology courses. Prerequisite: instructor's consent. Graded on a S/U basis only.

404—The Literature Review (3). The course focuses on methods for gathering, summarizing, integrating and interpreting research on the same topic. Topics include search the literature, evaluating research quality and synthesizing statistical results across separate studies. Prerequisite: 419.

405—Survey of Social Psychology (3). Survey of historical and contemporary theory and research in affiliation, attribution, social comparison, attitude change and group dynamics. Prerequisite: graduate standing.

406—Psychology of Development (3). Principles, theories, research in normal human development. Prerequisite:

graduate standing or instructor's consent.

407—Developmental Psychopathology (3). Etiology, diagnosis, and treatment of disordered behavior from infancy through adolescence. Emphasizes contrasting theories and research issues. Prerequisite: graduate standing and instructor's consent.

408—Adult Psychopathology (3). Problems of etiology, diagnosis, treatment in psychopathology. Considers theory, research, case histories. Prerequisite: graduate standing and instructor's consent.

409—Experimental Psychopathology (3). Critical examination of current theories, with special emphasis on empirical studies in psychopathology including such topics as alcoholism, enuresis, sexual deviancy, drug addiction, mental retardation. Prerequisite: graduate standing and instructor's consent.

411—Studies in Professional Problems (2-3). Sources for psychological literature research, techniques of scientific reporting, problems of professionalism. f.

412—Ethical and Professional Issues in Psychology (3). Comprehensive coverage of ethical codes and issues in psychological research and service: confidentiality, consent, deception, parentalism, voluntariness-coercion, exploitation, dual relationships, value conflicts and imposition. Prerequisite: graduate standing and instructor's consent.

413—Psychometrics (3). Introduction to concepts and issues essential to psychological assessment including psychometrics, test construction, controversies in psychological testing, behavioral assessment, and structured interviewing.

414—Orientations to Clinical Assessment (3). Topics include psychometric principles, intelligence testing, objective and projective personality testing and behavioral assessment. Prerequisite: 418 (Psychometrics).

418—Studies in Clinical Psychology (1-99). Contemporary research and theory for advanced graduate students in clinical psychology. Prerequisite: departmental consent for repetition.

419—Advanced Psychological Statistics I (3). Theory of testing statistical hypotheses, estimation techniques, nonparametric statistics. Prerequisite: undergraduate course in Statistics. f.

420—Advanced Psychological Statistics II (3). Complex analysis of variance; experimental design. Prerequisite: 419 or equivalent. w.

421—Advanced Techniques in Psychological Statistics (3). Multivariate statistic methods, including multivariate analysis of variance, discriminate analysis, principal component analysis, and elements of matrix algebra, as applied to problems in psychology. Prerequisite: 419 and 420.

422—Studies in Experimental Psychology (1-99). Critical consideration of selected experimental work in psychology of learning and memory. Prerequisites: 378 or 379; departmental consent for repetition. w.

423—Statistical Reasoning (1-99). Covers the design and analysis of experimental research. Emphasis on students' own research projects. Prerequisites: instructor's consent. Graded on a S/U basis only.

424—Studies in Physiological Psychology (1-99). Critical consideration of recent experimental, theoretical work. Prerequisites: 313, departmental consent for repetition. w.

425—Orientations in Psychotherapy (3). Broad survey of orientation to psychological treatment, emphasizing integration of personality theory, techniques of personality and behavior change, and research findings in the area. Prerequisite: graduate standing and instructor's consent.

431—Latent Variable Models in Statistical Analysis (3). Covers Matrix Algebra fundamentals, Factor Rotation, Communality Estimation techniques, High Order and Dynamic Factor Models, Path Analysis, Use of computer programs. Prerequisite: Psychology 420

432—Social and Cultural Identity Development (3). Examines the theories of and research on racial, ethnic, and social group identity development throughout the lifespan. Prerequisite: instructor's consent.

433—Seminar in Social Psychology I (3). (same as Sociology 433). Intensive review of concepts and theories of social psychology; emphasizes readings from primary sources. Ph.D. candidates only. Required for all Ph.D. candidates in social psychology program. Prerequisite: instructor's consent. f.

434—Theories of Social Psychology I (3). Intensive review of classic concepts and theories of social psychology; emphasizes readings from primary sources. PhD candidates only. Required for all PhD candidates in social psychology. Prerequisite: instructor's consent.

435—Theories of Social Psychology II (3). continuance of 434. Intensive review of contemporary concepts and theories of social psychology; PhD candidates only. Required for all PhD candidates in social psychology program. Prerequisite: instructor's consent.

439—Human Sexuality for Psychotherapists (3). Background information for and methods and techniques of dealing with a variety of sexual problems that clients bring to therapists. Sexual dysfunction, homosexuality, sexual abberrations and sex crimes covered. Prerequisite: graduate standing and instructor's consent.

440—Use of Computers in Psychology (3). Surveys uses of digital computing systems in psychology and other behavioral sciences. Topics include structuring data bases, language processing, simulation of mental/social processes, online facilities in research.

441—Behavior Therapy (3). Surveys principles and research finds relative to treatment of abnormal behavior through the utilization of learning principles. Prerequisites: advanced graduate standing in Psychology & instructor's consent. w.

442—Community Psychology (3). Lectures, discussion, readings, and field experiences to familiarize students with the philosophy, techniques, and theory of community psychology. Prerequisite: instructor's consent.

443—Studies in Social Psychology (1-99). Critical coverage of selected research and theory in social psychology. Prerequisites: instructor's consent, departmental consent for repetition.

444—Data Management and Analysis and Psychology (1). Computer implementation of data management and statistical analysis. Covers elementary computer operations, data entry, data quality control, and computer implementation of statistical models covered in Psychology 419 and 420. Prerequisite: instructor's consent.

445—Clinical Practicum (1-99). Intensive supervised training in use and interpretation of psychological techniques and in psychotherapy. Graded on S/U basis only. Prerequisite: graduate standing, instructor's consent and professional liability insurance.

446—Clinical Child Assessment (3). Introduction to clinical instruments, techniques and problems in the psychological assessment of children. Prerequisite: graduate standing and instructor's consent.

447—Clinical Intervention with Children (3). Introduction to theory, research and practice in the area of behavior change with children and adolescents. Prerequisite: graduate standing and instructor's consent.

449—Structured Groups (3). Intended to train students to develop and run structured groups for: 1. Life skills, e.g. anxiety management, effective parenting: 2. Life Theme, e.g. self-esteem, women's awareness: 3. Life Transition, e.g. divorce, personal loss. Prerequisite: instructor's consent.

450—Research (1-99). Experimental investigations not leading to thesis.

452—Motivation (3). Survey of contemporary theories and models of human motivation. Major emphasis is on theories of action control and integration of motivational, cognitive and affective processes in behavior. Prerequisite: graduate standing or instructor's consent.

453—Law and Behavioral Sciences (2). (same as Law 609L). Examines the history of and current interfaces between law and psychology to increase the understanding and value of behavioral science research findings and expertise in assisting the courts in rendering informed and just decisions.

454—Psychopharmacology for Psychologists (3). Basic principles of drug action on the nervous system, the theory and clinical use of the various psychotherapeutic drugs, drug abuse and its treatment. Prerequisite: graduate standing or instructor's consent.

455—Small Sample Size Design and Analysis (3). Introduction to the design and analysis of studies involving single subjects and other small samples. Prerequisite: one graduate level statistics course.

460—Human Learning and Memory (3). Current theory and research in the area of human learning and memory will be investigated. A major component of the course will involve the critical review of existing literature in this area. Prerequisite: graduate standing or instructor's approval.

461—Advanced History of Psychology (3). Advanced course in history of psychology designed to show how general philosophical models of mind and behavior have been linked to doctrines of mental health and pathology and to theories of social behavior. Prerequisite: instructor's consent.

462—Family and Group Process (3). Conceptual approaches to family and group interaction considered; contemporary research and treatment. Prerequisite: graduate standing and instructor's consent.

463—Conditioning and Learning (3). Basic principle of operant and Pavlovian learning, motivation, extinction, inhibition, avoidance, etc., and their application to human behavior and its modification. Prerequisite: graduate standing or instructor's consent.

485—Social Psychology Methodology (3). Advanced study of experimental methods in social psychological research. Prerequisites: 343 and instructor's consent. w.

486—Applied Research Methodology (3). Advanced study of methods and methodological issues associated with psychological research conducted in field or nonexperimental settings. Topics include measurement of change, structural modeling, time series, quantitative literature reviewing. Prerequisite: instructor's consent.

490—Research (1-99). Investigations in psychology; leads to thesis. Graded on a S/U basis only.

494—Cognitive Psychology (3). The course focuses on basic research on human perception, memory, attention and thought. This course is part of the core curriculum required for graduate studies in psychology. Prerequisites: graduate standing or approval of instructor.

Public Administration

College of Business and Public Administration
315 Middlebush Hall (573) 882-3304

FACULTY

Guy B. Adams, chair, director of graduate studies, professor, DPA, George Washington University.

Michael A. Diamond, professor, PhD, University of Maryland.

Sheilah Watson Bishop, associate professor, PhD, University of Oklahoma.

John P. Forrester, associate professor, DPA, University of Georgia.

Charles L. Sampson, interim graduate dean, associate professor, PhD, University of Pittsburgh.

Lisa A. Zanetti, assistant professor, PhD, University of Tennessee-Knoxville.

DEGREES: MPA in public administration

COOPERATIVE DUAL DEGREE: MPA and JD, with an emphasis area in local government and administrative law.

The Department of Public Administration in the College of Business and Public Administration offers a master's degree as full academic preparation for administrative careers in local, state and national governments and other public organizations. The two-year professional program is open to students holding baccalaureate degrees from accredited institutions and meeting admission standards of the department and the Graduate School.

MASTER'S DEGREE: The MPA program enables students to develop:

- Knowledge of the institutional, political and behavioral aspects of public decision making
- Analytical skills for policy analysis and governmental problem solving
- Behavioral skills in the management of public organizations
- Values appropriate to public service

Consisting of 39 hours of graduate work, the MPA program includes a public administration core (24 hours), electives or area of specialization (9 hours) and an internship (6 hours). Students without adequate preparation in economics and statistics are required to take a course in each of those areas for no credit toward the degree.

A summer internship between the first and second years of study provides the student with field learning and experience in public administration. Internships may be arranged with local, state or federal governmental agencies and with nonprofit organizations.

For further information write the Director of Graduate Studies, Department of Public Administration, 315 Middlebush Hall, Columbia, MO 65211.

COURSES

400—Problems (1-99.9). Intensive study of an area of public administration related to the student's special interest.

402—Research Methods in Public Affairs (3). General principles of research in the social sciences; research methods most commonly used in public administration; information resources and efficient use thereof. Prerequisites: statistics (3.0 cr hrs.)

410—Administrative Law (3). (same as Law 530L). Principles, factors and statutory provisions which govern availability of relief (both judicial and administrative) to persons or entities aggrieved by the actions or inactions of governmental officials or agencies.

451—Organizational Dynamics in the Public Sector (3). Focuses on understanding human action in administrative situations and on developing personal capacities for effective action in varied and difficult situations. w.

452—National and Subnational Policy Processes (3). Processes through which public demands are generated, converted into formal policy, and implemented. Focuses on role of administrator, and institutional-organizational contexts in which administrator functions.

453—Public Policy Analysis (3). Systematic approaches in policy-making. Application of systems analysis, operations analysis, and other analytic techniques to selected policy decisions of state, local, and national governments.

454—Public Budgeting and Taxation (3). Intensive study of the institutions, processes, politics, and social and economic impact of public taxation and expenditures. Prerequisites: Accountancy 273, 325, 407, 425, and 435.

455—Public Financial Administration (3). Nature and environment of public financial administration. Principles of accountability for management of public funds; management and investment of cash balances; special problems related to long- and short-term debt.

457—Human Resources Management and Development in Public Organization (3). Examines the political, economic, and legal context of the human resource management and development function, as well as some of the technical aspects of the public personnel manager's job. Stresses the bureaucratic organizations and interpersonal skills necessary for effective organizational change and development.

459—Seminar in Public Financial Management (3). Capstone course where students are given an opportunity to address real world or simulated problems in their area of interest in public financial management.

464—Ethics and Administrative Responsibility (3). Explores the ethical dimension in historical, political, organizational, professional and interpersonal aspects of American society. Examines ethical challenges of the individual manager and moral foundations of social and public policy issues.

465—Organizational Analysis and Change in the Public Sector (3). (same as Management 465). Investigates the social and psychological dynamics of organizational diagnosis, feedback and learning, intervention, planned change. Students study organizational life from the viewpoint of experienced organizational analysts and consultants. The predominant theoretical approach offered in this course is clinical and psychodynamic.

466—Local Government Law (3). (same as Law 617L). Structure and powers of local government units; state-local relations, including "home rule"; local government finance, including taxation and indebtedness; incorporation and annexation; eminent domain; tort liability; land use controls; labor relations.

470—Urban Management and Service Delivery (3). Organization and division of service responsibilities among governments in urban areas. Problems of managing delivery of services with special emphasis upon program implementation, productivity, planning, responsiveness to citizens and intergovernmental relations.

472—Large Scale Organizational Change and Re-design (3). (same as Management 440). The change process in organizations with emphasis on planned, orderly development of organizational capabilities. Prerequisite: departmental consent.

473—Strategic Planning and Performance Measurement (3). This course will focus on the importance, description, and implementation of strategic planning in organizations. The overall objective will be to help prepare students to use strategic planning to adapt to change and to achieve organizational goals.

480—Public Administration Internship (1-6). Gives students an opportunity to gain experience in government operations by providing supervised work with an agency at the local, state, or federal level. MPA students only. f,w.

Radiologic Sciences

School of Health Related Professions
518 Lewis Hall (573) 882-8405

The School of Health Related Professions does not offer a graduate degree in radiologic sciences, but some courses are available to graduate students.

COURSES

303—Radiation Safety (3). Types and origins of radiation; radiation detection and measurement; radiation interactions; shielding; dose calculations; federal, state and local regulations; and procedures for safe uses of radiation. Laboratory experiments in radiation measurements and protection.

327—Nuclear Medicine Instrumentation (3). (same as Medical Physics 327). Radionuclide imaging systems and the use of computers. Topics include Anger camera systems, emission tomography, ultrasound, nuclear magnetic resonance, and bone absorptionmetry. Prerequisites: Chemistry 361 or equivalent and instructor's consent.

329—Radiopharmaceuticals in Nuclear Medicine (3). Introduces concepts of radiopharmacy, generator systems, labeling of materials, quality control procedures and FDA regulations concerning radiopharmaceuticals. Prerequisites: Chemistry 361 or equivalent and instructor's consent.

360—Cardovascular and Pulmonary Diagnostic Applications I (3). (same as Respiratory Therapy 360). Problem-based study of cardiopulmonary anatomy and physiology using current imaging methods. Emphasis given to assessment of the acutely distressed cardiac or pulmonary subject, emergency pulmonary support and vascular access techniques.

361—Cardiovasular and Pulmonary Diagnostic Applications II (3). (same as Respiratory Therapy 361). Advanced study of cardiac dysrhythmias, hypertrophy, and infarction, emphasizing aspects of treatment employed during Advanced Cardiac Life Support. Prerequisite: 360.

Radiology

School of Medicine
M201 Medical Sciences Building (573) 882-8183

The School of Medicine does not offer a graduate degree in radiology, but some courses are available to graduate students.

COURSES

227—Radioisotopes in Medicine and Biology (4). Survey of radiotracer applications in nuclear medicine, including basic principles of radioactive decay and radiation detection equipment used in nuclear medicine. Prerequisites: Chemistry 11 and Physics 11 and instructor's consent. f.

328—Introductory Radiation Biology (3). (same as Biological Sciences 328, Nuclear Engineering 328, Veterinary Medicine & Surgery 328). Concepts of ionizing radiations, their actions on matter through effects on simple chemical systems, biological molecules, cell, organisms, man. Prerequisite: junior standing Sciences/Engineering; one course in Biological Sciences & Physics/Chemistry; or instructor's consent.

400—Problems in Radiological Science (1-3). Supervised investigation in an aspect of radiological science usually culminating in a written report.

410—Seminar (1). Reports and discussion of recent investigations pertinent to radiological science.

Religious Studies

College of Arts and Science
405 General Classroom Building (573) 882-4769
e-mail: rsinfo@missouri.edu
http://www.missouri.edu/~religwww

FACULTY

Jill Raitt, chair, professor, PhD, University of Chicago.
Joel Brereton, associate professor, PhD, Yale University.
Sharon Welch, associate professor, PhD, Vanderbilt University.

Philip Clart, assistant professor, PhD, University of British Columbia.
Steve Friesen, assistant professor, PhD, Harvard University.
Horace Griffin, assistant professor, PhD, Vanderbilt University.
Paul Johnson, assistant professor, PhD, University of Chicago.

DEGREE: MA in Religious Studies

The MA degree requires at least 30 credit hours of graduate study, of which 24 are to be taken in residence. The program allows considerable latitude for different courses of study, and expects that each student will work out an appropriate selection of courses in consultation with a member of the department.

A core curriculum explores subjects fundamental to the study of religion and is required of all graduate students. The program requires that graduate students take a course in the methodologies of religious studies or demonstrate competence in this area, normally by demonstrating that they have taken an equivalent course elsewhere. Each fall, the department offers a course on Modern Perspectives in the Study of Religion that satisfies this requirement. In addition, the degree requires a sequence of three courses that examine the major forms of religious expression and religious action and teach students how scholars in the field have approached them.

These three courses are in the following areas:

Religious Texts and Interpretation—Courses 420-429. These courses will be a close examination of a canonical or foundation text and its role in the religious traditions in which it is authoritative. The course will consider both the traditional interpretations and appropriations of the text and contemporary methods of interpretation. The goal of the course is to understand and to use the fundamental tools of textual interpretation. The specific course topic will vary each semester.

Religious History—Courses 430-439. These courses will study the life of a religious community in its geographical and historical specificity. The goal of the course is to learn how to examine a particular religious community within its cultural, social and historical contexts. The specific course topic will vary each semester.

Comparative Religion—Courses 480-489. These courses will study points of contact or comparison within or among Asian, Western and Indigenous traditions. Topics may include religious issues common to various religions, problems of understanding and inequities of power in the encounter of religious traditions, and phenomenological categories of religion, such as sacred time or space. The goal of the course is to understand the methods and issues in the comparative study of religion. The specific course topic will vary each semester.

Specific topics in these courses will vary from year to year. In addition to these core courses, students will take course work or be able to show competence in one or more of the religious traditions of Asia, of the West, and of Indigenous peoples.

COURSES

201—Topics (3). Organized study of selected topics which vary by semester and are announced at time of registration. Prerequisite: sophomore standing or instructor's consent.

202—Early Christianity (3). (same as History 225). History of Christian origins and of the patristic period of the church; study of the beliefs and practices of Christianity, as reflected in its literature, art, music, architecture. Prerequisite: sophomore standing.

203—Medieval Christianity (3). (same as History 226). Study of the doctrinal developments, major theologians and schools, institutional formation and dissolution, mysticism, and liturgical expression within the context of cultural and political history. Beginning with Augustine and concluding with the 15th century. Prerequisites: sophomore standing.

204—History of Christianity, 1500-Present (3). (same as History 227). Protestant and Catholic Christianity in age of European expansion; enlightenment; 19th- and 20th-century challenges and responses. Prerequisites: sophomore standing.

215—Modern Religious Thought (3). Examination of the theological systems of major Christian thinkers and movements of the 19th and 20th centuries in relation to historic religious traditions and modern cultural challenges. Prerequisite: sophomore standing.

216—The Greek New Testament (3). (same as Greek 216). Readings in the Greek New Testament and similar literature, e.g., the Septuagint. Prerequisite: Greek 210 or instructor's consent.

217—History of Religion in America to the Civil War (3). (same as History 217). Studies major American religious traditions from the Age of Discovery to the Civil War, especially the evolution of religious practices and institutions and their influence upon American social, intellectual and political developments. Prerequisite: sophomore standing.

218—History of Religion in Post-Civil War America (3). (same as History 218). Surveys major American religious traditions from 1865 to the present. Focuses on the evaluation of religious practices and institutions and their interaction with and influence upon American social, intellectual and political developments. Prerequisite: Religious Studies/History 217 or instructor's consent.

219—Religion and Oppression/Faith and Freedom (3). This course will explore the existence of various social groups and demonstrate how religion historically has functioned both as a tool for their liberation and oppression. Prerequisite: sophomore standing or instructor's consent.

220—Origins of Rabbinic Judaism (3). Examination of the sources of Rabbinic Judaism and its doctrines of God, humanity, Israel and Torah. Prerequisites: 120 or instructor's consent.

222—Judaism in the Middle Ages through the Enlightenment (3). Social, economic, politcial and religious life of Jews in the medieval period; Jews in Islamic lands; Jewish mysticism; Jewish-Christian polemics; Hasidism; Enlightenment and Emancipation. Prerequisite: 120 or sophomore standing.

223—Second Temple Judaism: The Persian, Hellenistic, & Roman Periods (3). This course is an introduction to the origin and development of Judaism from the time of the destruction of the first Jerusalem temple (587 BCE) to the Bar Kochba revolt (132-135 CE). Prerequisite: any 100 level Religious Studies course or instructor's consent.

224—Rabbinic Judaism: Perspective and Literature (3). Overview of the Jewish oral tradition during the Rabbinic era. The information covered in this course will focus upon the vast literature created during the Mishnaic and Talmudic periods and the emerging new styles and directions of Jewish religious thought. Prerequisite: sophomore standing or instructor's consent.

225—Religion and Film (3). Addresses issues of interpretation and analysis in the convergence of religion and film. Addresses three areas under this broad rubric: 1) film representations of established religions; 2) film and the construction of social values; 3) film as contemporary "myth". Treating films as social texts, we will ask what such representations of ourselves to ourselves suggest about culture in general. Prerequisite: sophomore standing or instructor's consent.

232—Hinduism (3). (same as South Asia Studies 232). Origin and development of central themes of traditional Hinduism from earliest times to the modern period. Topics include: the Vedic tradition, rituals and practice, varieties of yoga, and meditation, Indian religious thought, and devotional Hinduism.

233—Buddhism of South and Southeast Asia (3). (same as South Asian Studies 233). Examines the origins of Buddhism in India, the narratives of the life of the Buddha, the development of early Buddist schools, the extension of Buddhism into Central and Southeast Asia, and the current practice of Buddhism in South and Southest Asia. Prerequisites: sophomore standing or instructor's consent.

234—Black Religion (3). (same as Black Studies 234). A history of religion approach to the study of black religion which takes into consideration the unique past experiences of the African American community as it underwent the terror of forced migration, slavery, segregation, and discrimination. Prerequisite: sophomore standing.

237—Native American Religions (3). (same as Anthropology 237). Investigation of religious lives of the native peoples of the Americas through cultural contact with modernity. Perspectives based on historical, anthropological and native texts. Prerequisite: 131 or sophomore standing.

239—Spirituality (3). Comparative investigation of selected mystical writings from Western religious traditions; consideration of contemporary psychological, philosophical, and Phenomenological interpretations of mystical experience. Prerequisite: sophomore standing or instructor's consent.

241—The Prophets (3). Study of the prophetic writings of the Hebrew Scriptures, with consideration of the origin and nature of Israelite prophecy. Includes the narratives of the period of prophetic activity and study of the classical prophets. Prerequisites: 141 or sophomore standing.

242—The Psalms and Wisdom Literature (3). Detailed interpretation of the Psalms, Proverbs and related writings of the broad wisdom tradition, with critical attention to the literary style and structure of the writings. Prerequisites: 141 or sophomore standing.

243—The Gospels of Matthew, Mark, and Luke (3). Examination of the Gospels of Matthew, Mark, and Luke as single works and as literarily related compositions. Interpretation focuses on the literary form of passages and the theological and ethical themes expressed. Prerequisite: sophomore standing.

244—Life and Letters of Paul (3). Reconstruction of the life and letters of the Apostle Paul; examination of his thought in relation to Jesus of Nazareth and to earliest Christianity. Prerequisite: 142 or equivalent.

246—Revelation and Apocalyptic Literature (3). A study of Jewish and Christian apocalyptic literature with an emphasis on the Revelation to St. John. Prerequisite: sophomore standing.

250—Directed Readings in Religion (3). Independent readings selected in consultation with supervisory faculty member. May not be repeated. Prerequisite: instructor's consent.

259—Greek and Roman Literature (3). (same as Classic Civilization 260). Survey of religious development among the Greeks and Romans. Prerequisite: sophomore standing and Classical Civilization 60 or Art History and Archaeology 10 or History 102.

263—Women and Religion (3). (same as Women Studies 263). A rediscovery of the wealth of religious activity which women have created and enacted. Investigates women's roles and rituals in large-scale and local religions, including ancient Goddess religions, Hinduism, Buddhism, Judaism, Christianity, Islam, and African, South American, and native American groups. Prerequisite: sophomore standing.

271—Modern Literature and the Quest for Values (3). This course is an interdisciplinary study of the religious and ethical questions, quests, and solutions in the literary works of selected modern writers: Beckett, Eliot, Camus, Kazantzakis, O'Connor, Updike, Wiesel, Percy and Morrison. Prerequisite: sophomore standing.

272—Biblical Themes in American Literature (3). A study of the sources in the Hebrew Scriptures and the New Testament and their reinterpretation in classic American texts. Such a study, initially textual, results in a history of American ideas. Authors studied include MacLeish, Baldwin, O'Connor, Updike, Percy and Morrison. Prerequisite: sophomore standing.

274—Jewish Christian Relations (3). Explores historical and contemporary relations between Christians and Jews, and the transformations in Christian thought and practice resulting from awareness of Christianity's role in the Holocaust and from post-Holocaust dialogues between Jews and Christians. Prerequisite: sophomore standing or instructor's consent.

275—Reality of God (3). Will explore the meaning of "the loss of God" (Tillich) and various 20th-century attempts to reaffirm the reality of God. Prerequisite: sophomore standing.

284—Chinese Popular Religion (3). Starting with a consideration of conceptual issues ("what is 'popular religion'?"), the course will give a survey of the beliefs and practices of Chinese popular religion, including ancestor worship, territorial cults, spirit-mediumism, divination, and popular sects. Prerequisite: sophomore standing.

290—Honors Seminar in Religion (3). To be arranged with instructor.

301—Topics (3). Organized study of selected topics which vary by semester and are announced at time of registration. Prerequisite: junior standing or instructor's consent.

310—The Catholic Intellectual Tradition (3). Students will read the great thinkers of the Catholic church such as Augustine, Abelard, Bernard of Clairvaux, Aquinas, Bonaventure, Nicholas of Cusa, Pascal, Newman, Maritain, Rahner, Johnson, Tracy. The theme examined may vary from year to year. Prerequisite: junior standing or instructor's consent.

311—Modern Perspectives in the Study of Religion (3). The course investigates the history of the study of religions, and methods used in scholarship; phenomenological, psychological, anthropological, sociological, form-critical and feminist perspectives on rituals of initiation are reviewed. Limited to majors and minors in Religious Studies. Prerequisite: Junior standing and Religious Studies major or minor or instructor's consent.

312—Major Religious Thinkers (3). Concentrated study of one or more selected theologians, such as Augustine, Aquinas, Luther, Calvin, Buber, Tillich, and Rahner. Prerequisites: junior standing.

325—Survey of West African and US Slave Religion (3). Explores traditional African religions and African Islam prior to the slave trade. Also, will examine the Christianity of African American slaves. Prerequisite: junior standing or instructor's consent.

326—African-American Religion (3). Examines the organization of major African American Christian denominations, Islam and religious movements. Twentieth century issues will be discussed, including sexism, classism and homophobia in church communities. Prerequisite: junior standing or instructor's consent.

330—Religious Narratives of South Asia (3). (same as South Asian Studies 330). Study of major narratives of India and their interpretation in literature and art. Topics include: Vedic and Epic mythology, stories of Krishna, myths and images of Shiva, and forms of the Goddess. Prerequisite: 130, or 232, or 233, or junior standing or instructor's consent.

342—The Historical Jesus (3). This course examines theory, method, and conclusions in recent Jesus scholarship. Attention is also paid to the historical and cultural context in which Jesus research becomes prominent. Prerequisites: 142 or instructor's cosnent.

350—Directed Readings in Religion (1-6). Independent readings selected in consultation with supervisory faculty member. May be repeated up to 6 hrs. Prerequisite: instructor's consent.

355—Elementary Biblical Hebrew I (3). This course will introduce students to the basic vocabulary, morphology, and syntax of Biblical Hebrew so they will be able to work with Biblical texts in the original language. Prerequisite: graduate standing or advanced undergraduate with instructor's consent.

356—Elementary Biblical Hebrew II (3). A continuation of Religious Studies 355, this course will include a research paper that will give students practical experience in using the resources. Prerequisite: graduate students or advanced undergraduate with instructor's consent.

383—The Confucian Tradition: Past and Present (3). Investigates Confucianism as the dominant religio-philosophical tradition of China and its impact on Korea and Japan. We will study basic Confucian canonical texts, follow its historical development, look at its interactions with other religions, and discuss the continuing relevance of the Confucian tradition in modern East Asia. Prerequisite: junior standing.

385—Introduction to Daoism (3). An introduction to the Daoist religious tradition, beginning with its background in earlier forms of philosophy, ritual, and belief. We will follow the development of the various Daoist schools and movements over the centuries and examine key aspects of their belief and practice, both historical and contemporary. Prerequisite: junior standing or instructor's consent.

399—Senior Seminar (3). A seminar in which Religious Studies majors use methods of understanding and comparing religions by focusing on times and places of significant contact among peoples of different religions. Prerequisite: 311 and Religious Studies Major.

401—Topics (3). Organized study of selected topics which vary by semester and are announced at time of registration. Prerequisite: graduate level or instructor's consent.

421—Religious Texts and Interpretation: The Veda (3). (same as South Asian Studies 421). This course examines the Veda, the foundational scripture of Hinduism. It includes close study of Vedic texts and rituals and the influence, interpretation, and application of the Veda in the later Hinduism. Prerequisite: graduate status or instructor's permission.

432—Religious History: Christian Interpretative Communities (3). This course compares notions of religious authority in the sixteenth century: the Roman Catholic Church's Scripture and tradition and the Protestant principle of sola scriptura. The focus is the doctrine of the Eucharistic disputes carried on throughout the sixteenth century. Prerequisite: graduate standing or instructor's consent.

475—Studies in Folklore (3). (same as Anthropology 484 and English 485). Focus on the roots of folklore scholarship and methodology and their evolution in modern approaches to the study of oral, traditional verbal genres and their performance in natural folk groups. Graduate standing or permission of instructor.

490—Research and Thesis (1-6). Research and writing for master's thesis. Graded on S/U basis only.

Romance Languages

College of Arts and Science
143 Arts and Science Building (573) 882-4874

FACULTY

Mary Jo Muratore, chair, professor of French, PhD, University of California-Davis. 17th century French literature; dramatic theory; Corneille, Racine; metadrama.

Marvin Lewis, associate chair, professor of Spanish, PhD, University of Washington-Seattle. Spanish-American literature; Afro-Hispanic literature and poetry; Hispanic minority literature.

Edward J. Mullen, director of graduate studies, professor of Spanish, PhD, Northwestern University. 20th century Spanish-American literature; Afro-Hispanic literature; Langston Hughes in the Hispanic world.

Paula Sommers, associate director of graduate studies, professor of French, PhD, Stanford University. French Renaissance literature.

Daniel E. Gulstad, professor emeritus of Spanish, PhD, University of Illinois. 20th century Spanish-American literature.

M. Bonner Mitchell, professor emeritus of French, PhD, The Ohio State University.

Henry Sullivan, professor of Spanish, PhD, Harvard University. Golden Age theater; Don Quixote; critical theory; Lacan.

O. Allen Thiher, Curators' Professor of French, PhD, University of Wisconsin. 20th century French literature; critical theory; poetics.

Michael Ugarte, professor of Spanish, PhD, Cornell University. 18th, 19th and 20th century Spanish literature; cultural studies; literary theory.

Juanamaria Cordones-Cook, associate professor of Spanish, PhD, University of Kansas. 20th Century Spanish-American literature; critical theory and methodology; Luisa Valenzuela.

Rangira S. Gallimore, associate professor of French, PhD, University of Cincinnati. Francophone literature; theoretical linguistics; 20th century French literature.

Magdalena García-Pinto, associate professor of Spanish, PhD, University of Texas-Austin. Women writers; feminist theory; Latin American culture; Hispanic linguistics; Latin American fiction and poetry.

Benjamin L. Honeycutt, associate professor of French, PhD, The Ohio State University. Medieval literature and philology; narrative of the Fabliaux and Lai.

Glenn P. Pierce, associate professor of Italian, PhD, University of California-Los Angeles. Manzoni; Italian Baroque; Romanticism.

Ana Rueda, associate professor of Spanish, PhD, Vanderbilt University. Contemporary peninsular Spanish narrative; interdisciplinary approaches to literature; women's narrative; literary theory and philosophy.

Daniel C. Scroggins, associate professor of Spanish, PhD, University of Michigan. Colonial Spanish-American literature; the essay; computerized instruction.

James K. Wallace, associate professor emeritus of French, PhD, Vanderbilt University. 19th century French literature; Baudelaire; French civilization.

Flore Zéphir, associate professor of French, PhD, Indiana University-Bloomington. Applied linguistics; foreign language education; sociolinguistics.

Rita Cavigioli, assistant professor of Italian, PhD, University of California-Los Angeles. Twentieth-century Italian literature.

Richard K. Dixon, assistant professor emeritus of French, PhD, University of Colorado.

Louis Lopez-Carretero, assistant professor of Spanish, PhD, Cornell University. Linguistics, syntactic theory, comparative syntax.

John Iverson, assistant professor of French, PhD,

University of Chicago. Eighteenth-century French literature.

Margaret Olsen, assistant professor of Spanish, PhD, Tulane University. Colonial Spanish American and Afro-Hispanic literature.

Charles Presberg, assistant professor of Spanish, PhD, Harvard University. Golden Age Spanish literature; prose narrative; Cervantes; Spanish Comedia; rhetorical criticism; structuralist and poststructuralist discourse.

John Zemke, assistant professor of Spanish, PhD, University of California-Davis. Medieval Spanish literature.

DEGREES: MA in Spanish, MA in French, MA in foreign language teaching and PhD in Romance languages

The Department of Romance Languages offers programs of study leading to master of arts degrees in French, Spanish or foreign language teaching and a doctor of philosophy degree in Romance Languages, with primary specializations in French literature, peninsular Spanish literature or Spanish-American literature. A person interested in pursuing any one of these degrees should request an application from the director of graduate studies of Romance Languages. The application should be accompanied by a transcript of all completed undergraduate and graduate work, GRE general test scores and three letters of recommendation. If accepted by the department, the student is then notified to apply for admission to the Graduate School through the Admissions Office, 230 Jesse Hall, Columbia, MO 65211.

Part-time teaching assistantships are available to departmental graduate students on a competitive basis. A student should indicate interest in being considered for one of these appointments in the initial letter to the director of graduate studies and on the application form.

All graduate students (except native speakers of French or Spanish) are given a language proficiency examination at the time of entrance to determine their ability to speak, understand and write their major language. Students who are judged deficient in any of these areas are required to do remedial work. New graduate students who are required to do remedial work because of the departmental language proficiency examination will be retested within one year. Students must receive a passing score, or their candidacy will be terminated.

MASTER'S DEGREE IN FRENCH OR SPANISH: Students may take an MA in French or in Spanish (with course work in both peninsular and Spanish-American literature), or they may elect a minor. Students interested in minors, which consist of a minimum of nine hours of course work selected from one or more departments, should consult the **Credit for Minor Study** section on page 8 of the catalog. These minors appear on a student's plan of study, but not on the transcript. Students electing minors are required to take the standard departmental master's examination in either Spanish or French.

A total of 30 hours selected from courses receiving graduate credit must be completed for the MA. At least 15 hours must be in courses 400 level or above. The study program for the MA in Spanish must include a minimum of nine hours of course work in peninsular Spanish literature and a minimum of nine hours of course work in Spanish-American literature. The number of hours of credit allowed for special readings and problems (courses 350 and 400) may not exceed nine. MA candidates may not count more than three hours in course 350 (special readings) in their major field toward their degree. A course in the history of the language (French 311 or Spanish 361) must be included in the study program. Teaching assistants with no pedagogical experience or those who have not taken a class in foreign language teaching methodology will be required to take French/Spanish 352, Foreign Language Teaching Methodology.

Candidates for the MA must present adequate preparation in advanced language and literature courses for admission. This will normally be four to five courses at a level equivalent to a 300-level course at MU. At least three of these courses must be in literature. If the admissions committee believes a deficiency exists, it will prescribe additional course work. Students will be informed of these additional requirements at the time of admission.

A thesis is optional. A maximum of six hours credit toward the 30 hours required for the MA will be allowed for the thesis.

Candidates for the master of arts degree are required to pass a six-hour written examination based on the MA reading list. Copies of the list are available in the departmental office. The examination is given twice a year (early September and late March). Two failures on the final examination will terminate candidacy for the degree.

MASTER'S DEGREE IN FOREIGN LANGUAGE TEACHING: Besides the regular MA program in Spanish and French, the department offers an emphasis area in foreign language teaching. This program appears on the student's plan of study and transcript. This program has been designed to offer an alternative to students who do not wish to pursue a traditional degree with an emphasis on literature. It also is offered as an option to prospective and current secondary school teachers.

Admission requirements for the MA with emphasis in foreign language teaching are identical to those for the traditional MA. A minimum of 30 hours must be completed; 20 of the 30 hours must be taken in either Spanish or French. At least 15 of the degree hours must be in courses numbered 400. Of these 400-level courses, six hours must be in the Department of Romance Languages. The remaining 10 hours may be taken from course work outside the department with the approval of the student's academic adviser.

DOCTORAL DEGREE: The department offers primary specialization for the doctorate in the following major fields: French literature, Spanish literature and Spanish-American literature. Candidates select secondary fields in consultation with their doctoral program committee. Interdisciplinary secondary fields are available in Medieval and Renaissance studies.

All prospective PhD candidates are required to take the qualifying examination to determine their fitness for doctoral study. Doctoral students who hold the MA from this department may be excused from the qualifying examination if their performance on the MA final examination is judged outstanding by the examining committee.

The qualifying examination, conducted by the student's doctoral program committee, is an evaluation and planning session to take place toward the end of the second semester of a doctoral candidate's studies here. During the evaluation portion of the session, the candidate makes a prepared presentation in two areas. These areas are a specific text and a general topic, both related to the student's previous course work. The topics are chosen by the program committee and are given to the candidate three days before the examination. The purpose of this procedure is to determine whether the student can present a coherent analysis of literary questions. Questioning at the evaluation portion of the session centers on these prepared topics. The results of this evaluation and an analysis of the student's performance in courses are combined for a recommendation of continuance of doctoral study or termination at the end of the second semester.

Students who are to continue then return for a planning session during which the committee examines the student's transcripts, questions the student about past preparation and decides what courses will be required for the completion of the student's doctoral program. If the performance is judged unsatisfactory, the student may repeat the examination toward the end of the second semester of doctoral studies. The committee may, at its discretion, make the second examination in part written. Failure of a second examination will terminate doctoral study in this department.

Before being admitted to the comprehensive examination, a candidate must demonstrate reading proficiency in at least one other foreign language.

Students whose secondary field is a foreign literature and who take at least three 300-level courses in that foreign literature will be considered to have fulfilled the requirement for a second language. Students also may demonstrate proficiency through successful performance on a test administered by the language department in question.

A student beginning doctoral work may satisfy the departmental Latin requirement in one of two ways:

- By passing a written examination administered by the department
- By completing Latin 207 with a grade of B or better. The Latin requirement should be fulfilled by the end of the first year of graduate study.

A candidate for the doctorate in French is required to have some formal training in Old French. A candidate for the doctorate in Spanish must have some formal training in Old Spanish.

The comprehensive examination is composed of an oral and a written section. The written examination consists of four three-hour examinations, at least one of which must be written in the language of specialization. Should these written examinations be judged of sufficiently high

quality in content, organization and language, the candidate is admitted to the oral section, at least part of which is conducted in the candidate's language of specialization.

The final examination is oral and open to the public and is largely, but not exclusively, a defense of the dissertation.

Further details about degree requirements may be obtained from the departmental director of graduate studies.

COURSES

GENERAL

350—Special Readings (1-3). Prerequisites: 372 or equivalent and instructor's consent.

355—Literature of the African Diaspora (3). A study, in English translation, of writings by authors of African descent in the Americas. Prerequisite: junior standing or instructor's consent. w.

371—Introduction to General Linguistics (3). (same as Anthropology 371, Linguistics 371). Fundamentals of linguistic theory; collateral readings, problems. Prerequisite: sophomore standing.

372—Techniques in Linguistic Analysis (3). (same as Anthropology 372, Linguistics 372). Problems in analyzing data from various languages. Prerequisite: introductory course in Linguistics or instructor's consent.

373—Linguistic Phonetics (3). (Same as Anthropology 373 and Linguistics 373). Description and transcribing of the full range of sound types found in the languages of the world. Ear training and production practice. Distinctive feature theory. Prerequisite: 371 or equivalent. w.

374—Issues in Linguistic Analysis (3). (same as Anthropology 374, Linguistics 374). Survey of syntactic and semantic theory, with emphasis on transformation-generative notions; problems. Prerequisite: 371 or equivalent.

380—Linguistic Theory and Languages Acquisition (3). (same as Linguistics 380). The goal of this class is to study the implications of current linguistic theory for contemporary research on second language acquisition. In particular, the hypothesis that second language acquisition follows some of the same principles at first language acquisition is explored. Course is taught in English. Prerequisites: Spanish 379, French 378, English 340 or Linguistics 372.

400—Problems (1-99.9). Prerequisites: 372 or equivalent and instructor's consent.

410—Seminar: Topics in Literature & Languages of the African Diaspora (3). One of two courses devoted to the theory and practice of African diaspora literary criticism. Beginning with the United States, we address the issues of developing appropriate theoretical models for black literatures in the Americas. Prerequisite: graduate standing.

490—Research (1-99.9). Prerequisite: graduate standing. Graded on S/U basis only

493—Phonology (3). (same as Anthropology 493, Linguistics 493). Examination of current theory and methods of describing sound patterns of language; particular attention to the generative model and distinctive features. Prerequisite: 374 or equivalent.

FRENCH

201—Topics (1-99.9). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: sophomore standing, departmental consent for repetition.

206—Advanced French Composition and Conversation I (3). Development of more sophisticated skills of written and oral expression. Prerequisites: 106 and 126 or equivalent.

207—Intensive Beginning French (3). Rapid acquisition of a reading knowledge of French. Cannot be taken to fulfill undergraduate language requirement. Prerequisites: graduate standing or instructor's consent.

208—Commercial French (3). Composition and Conversation course based on materials related to the French business world. Acquisition of business related vocabulary. Introduction to French business operations and correspondence. Prerequisites: 106 and 126 or equivalent.

225—Modern French Feminism (3). (same as Women Studies 225). Introduction to major literary and theoretical texts by 20th century women writers, including an overview of contemporary French feminist thought. All work in English. Prerequisite: sophomore standing. w.

231—Introduction to French Literature I (3). Study of selected masterpieces of French literature from the Middle Ages through the 18th century. Prerequisites: 106 and 126 or equivalent.

232—Introduction to French Literature II (3). Study of selected masterpieces of French literature of the 19th and 20th centuries. Prerequisites: 106 and 126.

252—Survey of Minority & Creole Languages of the U.S. & the Caribbean (3). (same as Spanish 252 Linguistics 252). Analysis of the state of the minority languages of the U.S. and the Creole languages of the Caribbean with particular attention to the social status of these languages and speakers' attitudes toward them in context of ethnic, cultural and national identity (taught in Eng.). Prerequisite: sophomore standing.

260—French Phonetics (3). A comparison of French and English phonetic features with specific application to French pronunciation. Prerequisite: French 106 or equivalent.

296—Honors Reading in French (1). Directed readings in area of honors thesis. Prerequisite: admission to departmental Honors program.

297—Honors Thesis in French (3). Required of Honors candidates.

301—Topics (1-99.9). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing, departmental consent for repetition.

307—Advanced oral French for Teachers (1-99.9). Advanced speaking practice primarily for teachers with emphasis on pronunciation, syntactical accuracy and vocabulary expansion. Prerequisite: 206 or equivalent. May not be used toward A & S Major. May be repeated for a maximum of 12 hours credit.

311—History of the French Language (3). (same as Linguistics 311). Required of M.A. candidates Prerequisites: 106 and 126.

312—French Medieval Literature (3). Prerequisites: 231 or 232.

316—French Renaissance (3). Prerequisites: 231 or 232.

317—Seventeenth-Century French Literature (3). Prerequisites: 231 or 232.

318—Eighteenth-Century French Literature (3). Prerequisites: 231 or 232.

319—Nineteenth-Century French Literature (3). Prerequisites: 231 or 232.

320—Twentieth-Century French Novel (3). Prerequisites: 231 or 232.

321—Introduction to the Contemporary French Theatre (3). Prerequisites: 231 or 232.

323—Introduction to Modern French Poetry (3). Introduction to major currents of Frech poetry from beginning of the 19th century to the present. Students will write explications of poems, present oral analyses and will be tested on poetic terms and poetic content/styles of various poems and poets. Prerequisite: 231 or 232. Recommended: 206.

329—Nineteenth-Century French Novel (3). Prerequisite: 231 or 232.

330—African Francophone Literature (3). Course introduces contemporary African Literature to students via readings and detailed analysis of literary texts by Francophone African writers. Prerequisite: French 231 or 232.

350—Special Readings (1-3). Undergraduates must have permission of department chairman. Independent study through readings, conferences, reports. Prerequisites: 231 or 232.

352—Foreign Language Teaching Methodology (3). (same as Spanish 352). Theory and techniques of current foreign language methodology and their application in the classroom. Presentation of instructional projects, classroom observations, and strategies for classroom management. Prerequisite: graduate standing or approval by department. May not be used toward Arts & Science major.

353—Readings in French (2-3). Subject varies according to instructor. Prerequisites: 231 or 232.

354—Capstone: Literature and Society in France (3). Comprehensive overview of French language, literature and culture by studying cultural history and literary periods in France, from Medieval period to present. Prerequisite: French 231, 232 and junior or senior standing.

356—Stylistics (3). A technical study of French as a means of communication and of self-expression, involving levels of meaning, rhetorical structure, and textual analysis. Prerequisites: 206 or 208; 231 or 232.

378—Structure of Modern French (3). (same as Linguistics 378). An introductory presentation of the phonological and syntactic systems of contemporary standard French. Prerequisites: 206 or equivalent or instructor's consent.

400—Problems (1-99.9). Prerequisite: graduate standing.

401—Bibliography and Methods (3). Principles and aims of literary scholarship; systematic study of bibliographic resources for research. Prerequisite: graduate standing.

402—Bilingualism and Language Contact (3). (same as Spanish 402). Global analysis of the study of Bilingualism from a combined sociocultural, sociolinguistic and psycholinguistic perspective based on current research and examination of various phenomena of language contact (taught in Eng.). Prerequisite: graduate standing.

410—Seminar (2-3). Subject varies according to instructor. Prerequisite: graduate standing.

411—Old French (3). Recommended: 311 and some knowledge of Latin.

412—Studies in French Medieval Literature (3). Recommended: 312. Prerequisite: graduate standing.

416—Studies in the French Renaissance (3). Prerequisite: graduate standing. Recommended: 316.

417—Studies in Seventeenth-Century French Literature (3). Prerequisite: graduate standing. Recommended: 317.

418—Studies in Eighteenth-Century French Literature (3). Prerequisite: graduate standing. Recommended: 318.

419—Studies in Nineteenth-Century French Literature (3). Prerequisite: graduate standing. Recommended: 319 or 329.

420—Studies in Twentieth-Century French Literature (3). Prerequisite: graduate standing. Recommended: 320, 321, or 323.

480—Readings (3-6). Independent readings in preparation for the Ph.D. comprehensive examination in French. Prerequisite: graduate standing.

490—Research (1-99). Prerequisite: graduate standing. Graded on a S/U basis only.

ITALIAN

201—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition. No knowledge of Italian required.

206—Advanced Italian Composition (3). An advanced grammar course that endeavors to a) develop writing skills, in connection with a variety to text types; b) refine study skills and c) improve style through the study of contemporary Italian culture. Prerequisite: Italian 103.

207—Intensive Beginning Italian (3). Designed for rapid acquisition of a reading knowledge of Italian. Cannot be taken to fulfill undergraduate language requirement. Prereq-

uisites: graduate standing or instructor's consent.

214—The Films of Pier Paolo Pasolini (3). Studies the films of Pier Paolo Pasolini, Italian director, author and intellect. This course will trace the development of the artist (post semiotics and gramscian socialism to nihilism) across his films. A selection of his written works will be considered as background to the intellectual content of his films. Prerequisite: 112 and English 91 or 92, or permission of instructor)

231—Introduction to Italian Literature (3). This course purports to introduce students to the literary terminology that will enable them to study Italian literature. Prerequisite: Italian 103 and 205.

232—Survey of Italian Literature (3). Designed to expose students to the rich variety of Italian letters. Emphasis will be placed on textual analysis as well as on authors, themes and stylistic features. Prerequisite: Italian 231.

297—Honors Thesis in Italian (3). Required of Honors candidates. Prerequisite: major in Italian.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing, departmental consent for repetition.

321—Dante (3). Prerequisite: 3 or equivalent.

350—Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisite: 3 or equivalent. f,w.

400—Problems (1-99.9). Prerequisite: graduate standing.

PORTUGUESE

201—Topics (1-99.9). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: sophomore standing, departmental consent for repetition.

206—Advanced Portuguese Composition and Conversation (3). Prerequisite: 106 or 109.

207—Intensive Beginning Portuguese (3). Designed for rapid acquisition of a reading knowledge of Portuguese. Cannot be taken to fulfill undergraduate language requirement. Prerequisites: graduate standing or instructor's consent.

311—Survey of Portuguese Literature (3). Masterpieces of continental Portuguese literature from its origins to present. Prerequisites: 3, 207 or equivalent.

331—Survey of Brazilian Literature (3). Survey of Brazilian literature from colonial period to present. Prerequisites: 3, 207 or equivalent.

350—Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisite: 3 or equivalent.

353—Readings in Portuguese (2-3). Subjects either in Brazilian or Portuguese literature. Varies according to instructor. Prerequisites: sophomore standing or instructor's consent.

400—Problems (1-99). Prerequisite: graduate standing.

SPANISH

201—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: sophomore standing. departmental consent for repetition.

205—Advanced Spanish Conversation (3). Prerequisite: 106 or equivalent.

206—Advanced Spanish Composition (3). Prerequisite: 106 or equivalent.

207—Intensive Beginning Spanish (3). Designed for rapid acquisition of a reading knowledge of Spanish. Cannot be taken to fulfill undergraduate language requirement. Prerequisite: Graduate standing or instructor's consent.

208—Commercial Spanish (3). Business terminology and forms. Translate and compose business letters and documents for advertising and promotion, trade and commerce, imports and exports, money and banking. Prerequisite: 106 or equivalent.

223—Mexican Culture and Civilization (2-3). Study of Mexican culture and civilization through field trips, excursions and selected readings in Mexican history and literature. No knowledge of Spanish required. Open only to participants in UMC's study programs in Mexico. Prerequisites: sophomore standing or instructor's consent.

226—Latin American Women Writers (3). (same as Women Studies 226). An introduction to major literary and theoretical texts by twentieth century Latin American women writers in translation. Readings and class work in English. Prerequisite: sophomore standing. w.

231—Introduction to Hispanic Literature I (3). Selected prose fiction and nonfiction prose of Spain and Spanish America. Prerequisite: 206 or equivalent.

232—Introduction to Hispanic Literature II (3). Selected plays and poetry of Spain and Spanish America. Prerequisite: 206 or equivalent.

252—Survey of Minority & Creole Languages of the U.S. & the Caribbean (3). (same as French 252 and Linguistics 252). Analysis of the state of the minority languages of the U.S. and the Creole languages of the Caribbean with particular attention to the social status of these languages and speakers' attitudes toward them in context of ethnic, cultural and national identity (taught in Eng.). Prerequisite: sophomore standing.

260—Phonetics (3). (same as Linguistics 260). (Spanish Language). Prerequisite: 106.

296—Honors Readings in Spanish (1). Directed readings in area of Honors thesis. Prerequisite: admission to departmental Honors program.

297—Honors Thesis in Spanish (3). Required of Honors candidates.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: junior standing. departmental consent for repetition.

307—Advanced Oral Spanish for Teachers (1-99). Advanced speaking practice primarily for teachers with emphasis on pronunciation, syntactical accuracy and vocabulary expansion. Prerequisite: 206 or equivalent. May not be used toward A & S major. May be repeated for a maximum of 12 hours credit.

309—Spanish Medieval Literature (3). Prerequisites: 231 and 232

310—Renaissance and Golden Age Poetry (3). Prerequisites: 231 and 232.

311—Renaissance and Golden Age Prose (3). Prerequisites: 231 and 232.

312—Spanish Theatre in the Golden Age (3). Prerequisites: 231 and 232.

313—Don Quijote (3). Prerequisites: 231 and 232.

317—Spanish Poetry in the Nineteenth and Twentieth Centuries (3). Prerequisites: 231 and 232.

318—Nineteenth-Century Spanish Drama (3). Prerequisites: 231 and 232.

319—Nineteenth-Century Spanish Novel (3). Prerequisites: 231 and 232.

320—Twentieth-Century Spanish Drama (3). Prerequisites: 231 and 232.

321—Twentieth-Century Spanish Novel (3). Prerequisites: 231 and 232.

322—Advanced Contemporary Culture of Spain (3). Study of Spanish culture and civilization through field trips, excursions, and selected readings in history, literature, and contemporary print media. Prerequisite: 205, 206, 260 or equivalent. Open only to participants in the UMC's summer study in Spain.

324—Literature of the Spanish Civil War (3). A study of the Spanish Civil War in all its manifestations: political, historical, ideological and literary. Specific attention will be devoted to the literature as a means of conveying ideas on war and peace. Prerequisite: 231 and 232.

326—Advanced Contemporary Culture of Spanish America (3). A study of Spanish-American culture and civilization through selected readings in history and literature, and the use of visual media. Prerequisite: Spanish 206, 209, 260 or equivalent. A-F grading only. w.

327—Advanced Spanish Civilization (3). A survey of Spanish culture and Spanish history from the Middle Ages to the present with special emphasis on contemporary culture. Students will be provided with knowledge of chronology, geography and contemporary issues from readings of journals, novels and Internet news. Prerequisites: 205 and 206.

331—Survey of Spanish American Literature I (3). From beginning to 1880. Prerequisites: 231 and 232

332—Survey of Spanish American Literature II (3). From 1880 to present. Prerequisites: 231 and 232.

335—Mexican Literature (3). Prerequisites: 231 and 232.

339—Hispanic Oral Traditions (3). This course proposes to examine the Hispanic Oral Tradition through a study of romances and related genres, the corrido, decima and folktale. Prerequisites: Spanish 231, and 232.

341—Argentine Literature (3). Prerequisites: 231 and 232.

345—Modernista and Contemporary Poetry (3). Prerequisites: 231 and 232.

350—Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisites: 3 or equivalent. Undergraduates must have departmental chairman's consent.

352—Foreign Language Teaching Methodology (3). (same as French 352). Theory and techniques of current foreign language methodology and their application in the classroom. Presentation of instructional projects, classroom observations, and strategies for classroom management. Prerequisite: graduate standing or approval by department. May not be used towards Arts & Science major.

353—Readings in Spanish (2-3). Subject varies according to instructor. Prerequisites: 231 and 232.

355—The Spanish American Theatre (3). Prerequisites: 231 and 232.

356—Stylistics (3). Prerequisite: 206. Recommended: 231 and 232.

357—Afro-Hispanic Literature (3). A study of prose, poetry, and drama, in Spanish, written by authors of African descent in the Americas. Prerequisite: 231 and 232. f.

361—History of the Spanish Language (3). (same as Linguistics 361). Diachronic analysis of phonological, morphological, and syntactical systems of Spanish, from Vulgar Latin to contemporary dialects. Prerequisite: reading knowledge of Spanish. Recommended: 231 and 232.

379—Structure of Modern Spanish (3). (same as Linguistics 379). Synchronic analysis of phonology, morphology and syntax of spoken Spanish dialects. Prerequisites: 4 200-level courses in Spanish.

392—Nobel Laureates in Spanish American Literature (3). Analyzes the creative expression of five Nobel laureates from Spanish America. Selected works of Gabriela Mistral, Pablo Neruda, Miguel Angel Asturias, Octavio Paz and Gabriel Garcia Marquez are read in relation to contemporary theory. Prerequisites: Spanish 231 and 232.

400—Problems (1-99). Prerequisite: graduate standing.

402—Bilingualism and Language Contact (3). (same as French 402). Global analysis of the study of Bilingualism from a combined sociocultural, sociolinguistic and psycholinguistic perspective based on current research and examination of various phenomena of language contact (taught in Eng.). Prerequisite: graduate standing.

410—Seminar (2-3). Subject varies according to instructor. Prerequisite: graduate standing.

412—Studies in Spanish Literature of the Medieval Period (3). Prerequisite: graduate standing. Recommended 460.

415—Studies in Spanish Literature of the Renaissance

(3). Prerequisite: graduate standing.
416—Studies in Spanish Literature in the Golden Age (3). Prerequisite: graduate standing.
419—Studies in Nineteenth-Century Spanish Literature (3). Prerequisite: graduate standing.
420—Studies in Twentieth-Century Spanish Literature (3). Prerequisite: graduate standing.
427—Studies in Colonial Spanish American Literature (3). Analysis of seminal literary and "Historical" texts interpreting the Encounter, Conquest and Colonization of Spanish America.
430—Studies in Spanish-American Poetry (3). Prerequisite: graduate standing.
431—Studies in Spanish-American Fiction (3). Prerequisite: graduate standing.
433—Studies in the Spanish-American Theatre (3). Prerequisite: graduate standing.
460—Old Spanish—Phonology, Morphology and Syntax (3). Prerequisite: knowledge of Latin, to be demonstrated by passing departmental written examination or by completing Latin 201 with grade of B or better.
480—Readings (3-6). Independent readings in preparation for Ph.D. comprehensive examination in Spanish. Prerequisite: graduate standing.
490—Research (1-99). Prerequisite: graduate standing. Graded on a S/U basis only.

Rural Sociology

College of Agriculture, Food and Natural Resources
102 Sociology Building (573) 882-6357
www.ssu.missouri.edu

FACULTY

Kenneth E. Pigg, chair, associate professor, PhD, Cornell University.
Rex R. Campbell, professor, PhD, University of Missouri-Columbia.
Edward W. Hassinger, professor emeritus, PhD, University of Minnesota.
William D. Heffernan, professor, PhD, University of Wisconsin.
Daryl J. Hobbs, professor, PhD, Iowa State University.
Herbert F. Lionberger, professor emeritus, PhD, University of Missouri-Columbia.
Robert L. McNamara, professor emeritus, PhD, The Ohio State University.
Michael F. Nolan, professor, PhD, The Pennsylvania State University.
David O'Brien, professor, PhD, Indiana University.
Jere L. Gilles, associate professor, PhD, Cornell University.
Joel A. Hartman, associate professor, PhD, The Pennsylvania State University.
John H. Holik, associate professor emeritus, PhD, University of Missouri-Columbia.
Donald W. Littrell, associate professor emeritus, PhD, University of Missouri-Columbia.
James R. Pinkerton, associate professor emeritus, PhD, University of Wisconsin.
J. Sanford Rikoon, associate professor, PhD, Indiana University.
Jack D. Timmons, associate professor emeritus, PhD, University of Missouri-Columbia.
Jerry Wade, associate professor, PhD, University of Missouri-Columbia.
Elizabeth Barham, assistant professor, PhD, Cornell University.
James R. Davis, research assistant professor, PhD, University of California-Davis.
Andrew Raedeke, research assistant professor, PhD, University of Missouri.
James K. Scott, research assistant professor, PhD, University of Missouri-Columbia.
Mary Simmons Leuci, extension assistant professor.

DEGREES: MS and PhD in rural sociology

The Department of Rural Sociology offers the MS and PhD degrees. The program consists of broad training in sociological theory and methodology with attention to application and policy issues. All students take a core of four courses in statistics, theory and methodology. Areas of specialization in the department are: the sociology of the environment and natural resources and community studies.

PROFESSIONAL MASTER'S DEGREE: The degree is designed for persons who wish to have the training needed to carry out applied research, policy analysis and program evaluation in a government or business. The 39-credit program includes a six- to eight-credit-hour internship.

An undergraduate degree in a social science or equivalent is desirable. A basic understanding of statistics also is necessary. Up to 12 hours of makeup work may be required for students who have less than adequate undergraduate preparation.

Course requirements: Courses in three areas are required: methodology/statistics, rural sociology and electives related to an area of interest. Methodology courses should include Sociology/Rural Sociology 376 (or its equivalent), Rural Sociology 430, and two more courses in methodology and statistics. Students must take three courses out of the rural sociology core curriculum. The core courses are Rural Sociology 305, 310, 335, 340, 406, 425, 444 and 447. Four or more additional courses are to be selected by the student and the advisory committee. These may include additional methodology courses. The purpose of these courses is to help the student develop a substantive expertise.

Practical experience: Each student will have a practical experience through an internship doing applied social science work with a private or a public agency. The type of internship will vary according to student needs and interests, but it should be the equivalent of at least three months of full-time employment. Students will receive six to eight credits for this experience and will prepare a written report of their experience. Previous experience may be substituted for part of this requirement.

This degree is not a terminal degree. Its primary purpose is to train people to work as applied social analysts and program specialists/managers. Thus, fulfilling the requirements for the professional degree is usually not adequate preparation for a PhD program in rural sociology. Usually, a student will need to take additional courses in theory and research methodology to be admitted to a PhD program.

MASTER'S DEGREE: A traditional 30-hour master's degree with thesis also is offered. Students choosing the 30-hour MS degree may expect to continue toward a PhD.

Decisions on admission to the master's program are made by the admissions and awards committee based on an application consisting of the student's academic record, GRE or MAT test scores, letters of recommendation and a statement of interest.

DOCTORAL DEGREE: Although it is desirable that entering students have a strong background in sociology, students of high merit who do not have such a background are encouraged to apply. Such applicants may be required to take such graduate-level work as is necessary to remedy deficiencies in their background.

Besides the core of courses for all graduate students, students in the PhD program take a core consisting of an advanced quantitative methods course, an advanced qualitative methods course and an advanced theory course. Students will specialize by taking at least nine hours, including a 400-level seminar, in one of the following areas: sociology of agriculture and natural resources or community studies.

Students with a BS/BA degree may pursue the PhD program without obtaining a master's degree. In those cases, the student may prepare a research article for submission to a professional journal or a thesis.

The qualifying examination is given in June. The comprehensive examination is prepared and evaluated by the student's advisory committee. Admission to the PhD program is determined by the admissions and awards committee using the same documentation as indicated for the master's program. Request for financial support is made by the student at the time of application. Most of the financial support is for research assistantships.

COURSES

201—Topics in Rural Sociology (1-3). Organized study of selected topics. Subjects and earnable credit vary from semester to semester. May be repeated. Prerequisites: Rural Sociology 1, Sociology 1 and Anthropology 1.
205—Leadership in Today's World (3). Examination of dynamics of group leadership, especially in local voluntary organizations; study of how leader's behavior is related to success or failure of organization's program. Prerequisites: Rural Sociology 1 or Sociology 1.
214—The Family (3). (same as Sociology 214).
216—Urban Sociology (3). (same as Sociology 216). Prerequisites: Rural Sociology 1 or equivalent; or Sociology 1 or 4.
225—Social Processes of Communication and Diffusion (3). Overview of the social process of effective interpersonal communication, mass media impact and strategies for implementing the acceptance of new ideas and practices within social systems or societal sectors. Prerequisites: Rural Sociology 1 or Sociology 1.
238—Developmental Perspectives and Third World Realities (3). A broad social science approach to the problems of underdeveloped and developing societies, with special reference to the rural poor of Africa, Asia, and Latin America.
290—Practicum (3). (same as Sociology 290). Independent research or professional experience under faculty supervision. Projects must be arranged by student and faculty member prior to registration. Prerequisites: junior standing, departmental consent.
299—Recent Theories in Sociology (3). (same as Sociology 299).
300—Problems (1-99.9). Prerequisite: instructor's consent.
301—Topics in Rural Sociology (2-3). Organized study of selected topics. Subjects and earnable credit vary from

semester to semester. May be repeated. Prerequisites: 6 hours Rural Sociology or Sociology, or junior standing.

305—Social Demography (3). (same as Sociology 305). Prerequisite: 1 or Sociology 1 and junior standing.

310—Sociology of Agriculture and Natural Resources (3). Overview of current issues in the study of rural society. Emphasizes the relationship between social organization, agriculture, natural resources and the global economy.

311—Sociology of Social Policy (3). (same as Sociology 311). Sociological theories and methodolgies focused on social policy; policy as process, contextual and critical policy analyses; assessing policy effects and consequences. Prerequisite: senior standing.

335—Social Change and Trends (3). (same as Sociology 335). Nature of social change. Emphasis on sociological theories and models of social change and their application in analysis and implementation of change in social structures. Prerequisites: 1 or Sociology 1 and junior standing.

341—Building Communities from the Grassroots (3). Introduction and application of basic community development concepts, methods and practical skills for involving and empowering local citizens and leaders effectively in community- based efforts regardless of the issue. Prerequisite: graduate standing or instructor's consent.

370—Environment and Society (3). An interdisciplinary examination of domestic and international environmental issues focusing on social, cultural, and policy dimensions. Perspectives of the social sciences and humanities are included. Prerequisites: junior, senior or graduate standing.

375—Social Statistics (3). (same as Sociology 375). Descriptive statistics and bivariate quantitative analysis techniques commonly used by social scientists. Includes coverage of parametric and non-parametric methods. Introduction of computer applications.

376—Advanced Social Statistics (3). (same as Sociology 376). Introduction of multivariate analysis for social scientists. Emphasis on non-experimental applications of analysis of variance and correlation regression. Computer applications emphasized. Prerequisite: 375 or equivalent.

400—Problems (1-99.9). Research for student capable of semi-independent work. Prerequisite: instructor's consent.

403—Program Development and Evaluation (3). (same as Agricultural Education 470). Program development principles, teaching plans and evaluation principles applied to extension program development. Prerequisite: instructor's consent.

406—Seminar in Social and Economic Development (3). (same as Sociology 406).

425—Communication and the Diffusion of Information (3). (same as Sociology 425). Factors conditioning communication and diffusion of ideas and practices; exercise of personal influence; role of change agents and agencies in the process of change. Prerequisites: graduate standing or instructor's consent.

430—Research Methodology (3). Basic methodological issues, design, and application in social science research. Qualitative and quantitative approaches examined. Student projects developed with data collection and computer application.

431—Seminar in Multivariate Analysis Techniques (3). (same as Sociology 431).

432—Seminar in Qualitative Methods in Sociology (3). (same as Sociology 432).

437—Synthesis of Theory and Method in Sociology (3). The purpose of the course is to provide the student with a critical understanding of the basic theoretical paradigms employed in the development of research projects in sociology. The course is designed for graduate students. Prerequisites: 376 and 430, or instructor's consent.

444—Seminar on the Organization of Agriculture (3). Various perspectives and theoretical orientations for examining the sociology of agriculture. Theoretical issues of social development as traced through the literature to contemporary research in the causes and consequences of change in agriculture.

445—Smr. on Issues in the Sociology of Agriculture & Natural Resoures (3). Issues in current research in the sociology of agriculture of developing and industrial nations. Links sociological theory with research in agriculture, examining contributions of applied research to sociological knowledge.

446—Community Social Structure (3). (same as Sociology 446). A compartative study of communities in different nations and in urban and rural areas. A primary focus of the course will be on social change in communities, in response to changing economic political social cultural, and ecological factors.

447—Seminar on Contemporary Issues in Rural Sociology (1-99.9).

450—Research (1-99.9). Research not expected to terminate in thesis or dissertation. Prerequisite: instructor's consent.

480—Quantitative Applications in Community Research (3). (same as Sociology 480). This course focuses on the application of social science research methods to the unique kinds of problems that arise in the study of whole communities. Prerequisite: Rural Sociology 430.

490—Research (1-99.9). Research leading to dissertation. Graded on a S/U basis only.

Social Work

College of Human Environmental Sciences
www.missiouri.edu/~sswmain
723 Clark Hall (573) 882-6206

FACULTY

Erma Ballenger, assistant professor, PhD, University of Nebraska.

Judith L. Burke, associate professor, PhD, Bryn Mawr College.

Charles Cowger, director, professor, PhD, University of Illinois.

Judith Davenport, professor, PhD, University of Wyoming.

Tammy Freelin, clinical instructor, MSW, University of Missouri-Columbia.

Michael Kelly, professor, PhD, University of Texas-Austin.

Larry Kreuger, associate professor, PhD, St. Louis University.

Joanne Mermelstein, associate professor, PhD, St. Louis University.

Stephen Moore, associate professor, PhD, University of Kansas.

Dianne Orton-Howard, clinical instructor, MSW, University of Iowa.

Joanne Perry, clinical instructor, MSW, St. Louis University.

Marjorie Sable, assistant professor, DrPH, University of North Carolina.

Paul A. Sundet, associate professor, PhD, University of Illinois at Urbana-Champaign.

Wilson Watt, assistant professor, PhD, University of Illinois-Chicago.

Robin Wingo, clinical instructor, MSW, University of Missouri-Columbia.

DEGREE: Master in Social Work

The master of social work degree program is designed to prepare the student for leadership in professional social work practice. The program is fully accredited by the Council on Social Work Education, of which the School of Social Work is a charter member.

Preparation for professional leadership encompasses two major components:

- **Foundation:** An in-depth understanding of social and behavioral knowledge and an ability to apply behavioral skills in generalist social work practice and
- **Concentration:** An individualized configuration of specific roles and contexts that enable the student to specialize in an area of social work practice

The graduate curriculum is organized to use the varied scientific and interdisciplinary sources of knowledge required for social work practice. It focuses on a field of practice either in clinical social work or in planning and administration.

The School offers two tracks: advanced clinical practice, and planning and administration. The fields of practice in clinical tracks include family and children's services, physical health services, and mental health services. Human services is the field of practice in the planning and administration track.

Decisions regarding concentrations are made by students in close consultation with faculty advisers. Elective courses, block field practicum and required policy, human behavior, research and practice courses comprise the areas of concentration.

The curriculum is based on a generalist conception of social work practice. During the first semester, major attention is given to the acquisition and development of foundation knowledge and behavioral skills, including environmental assessment and interaction skills. The concentration courses start during the second semester.

In the second year, classroom course work comprises the first semester. The second semester is devoted to a practicum related to the student's chosen area of concentration. The School uses practicum sites throughout Missouri and beyond.

The School is especially dedicated to improving the provision of social services to public-sector clientele. Students may elect to focus on rural social work. Course scheduling is designed to accommodate part-time and commuter students. An accelerated master's program is available to qualified graduates of accredited BSW programs.

Admission to the MSW program requires admission to the MU Graduate School and acceptance by the School of Social Work. Admission is on a competitive basis. Applications may be requested from the Graduate Secretary, 723 Clark Hall or online at the School's webpage. Application deadlines are January 15 for regular two-year program students and summer Advanced Standing students, and October 1 for winter Advanced Standing students. Students are encouraged to obtain applications early to properly prepare and compile the application packet.

Several scholarships are available. Graduate assistantships also are available, but vary depending on funding.

COURSES

220—Human Behavior and the Environment (3). The first of two required courses providing an introduction to selected

theories, multidisciplinary knowledge, and perspectives into human development and behavior. Prerequiste: English 20 and Social Work 25 or sophomore standing. Graded on A/F basis only.

225—Medical Social Problems (2). Interrelations of biological, psychological, social factors in understanding people with common physical illnesses. Prerequisites: junior standing & instructor's consent.

300—Problems in Social Work (1-3). Research and independent study projects offered on a tutorial basis to undergraduate social work students. Prerequisites: consent required.

301—Topics in Social Work (1-3). Special and emerging topics in social work and social welfare. Subject, content and credit varies depending on available faculty and student interest. For undergraduate and graduate students. Prerequisite: consent required.

302—Special Readings (1-3). Extensive readings in selected area or intensive reading in a special field. Prerequisites: consent required.

308—Comparative Social Policy (2-3). A comparative study of social policy aspects in the framework of international development. Policy areas include South Asia, as well as other regions relevant to such study. Prerequisite: instructor's consent.

310—Social Justice and Social Policy (3). Based on the concepts of human need and social justice, an historical and analytical approach to social welfare policies and programs. Prerequisites: first semester professional program standing; consent required. f.

315—Dynamics of Interviewing (3). Analysis of interviewing techniques employed in communication for securing reliable, valid data to modify behavior in accordance with professional objectives. Prerequisites: junior standing & instructor's consent.

319—Social Statistics (3). No credit for graduate social work students. Descriptive, analytic techniques applied to qualitative and quantitative social data. Prerequisite: senior standing.

320—Variations in Human Behavior (3). Basic concepts and principles regarding psychological/social dynamics of deviance; implications for social welfare policy and social interventions. Prerequisites: second semester professional program standing; consent required. w.

330—Introduction to Social Work Practice (3). Introductory, generalist practice theory course promoting student's understanding of professional social work practice as holistic, identifiable, unique configuration of knowledge, values and skills. Prerequisite: first semester professional program standing; consent required. f.

331—Strategies of Direct Practice (3). Examines social structures, processes: underlying assumptions/concepts of social change, client constellation, organizational arrangements, role relationships by which social workers define professional intervention. Prerequisites: 330 and 333; third semester professional program standing; consent required. Co-requisite: 390 and 398. f.

332—Introduction to Community and Organizational Processes (3). Introduction to contextual framework of social work practice with particular emphasis on community and organization as social systems. Prerequisite: first semester professional program standing; consent required. f.

333—Interaction Skills Workshop (3). Interaction skills for generalist practice at individual, group and community levels. Group communication and social influence theories address generic and unique aspects of interaction across systems. Uses laboratory instruction. Prerequisites: second semester professional program standing; consent required. w.

334—Theory and Practice of Social Group Work (3). Focuses on small group dynamics and models of group work practice suitable in all social work fields. Emphasizes practice theory and skills. Prerequisite: second semester professional program standing; consent required. w.

340—Research Methods for Social Work (3). Survey of research methods germane to the development of the knowledge base of social work practice. Prerequisite: second semester professional program standing; consent required. w.

345—Alcoholism: Treatment and Prevention (3). Provides knowledge generic to social work and other disciplines in alcoholism treatment. Integrated services approach to alcoholism emphasized. Didactic and experiential methods employed; development of self-awareness is stressed.

346—Rural Human Services (3). A study of the effect of rural and small community environments on the planning and delivery of social and health services. Emphasis on policy and program analyses relevant to rural issues and concerns.

347—Working with Minority Youth (3). (same as Black Studies 347). Develops awareness and understanding of social/psychological and cognitive realities influencing the behavior of minority youth. Content draws upon theories, research and practice skills relevant to understanding and counseling minority youth.

350—Introduction to Child Welfare Practice and Services (3). Introductory course designed to develop the student's awareness, understanding and appreciation of the field of child welfare and specifically of its most critical function: child protection.

351—Delinquency, Corrections & Social Treatment (3). Focuses on problems and causative factors in developing and maintaining delinquent and criminal behavior and attitudes: addressing critical and comparative understanding of social change strategies employed in this field.

380—Social Work Practice With Minorities: African-American Emphasis (3). Provides students with an appreciation of the black experience in the United States on a knowledge and feeling level.

385—Helping Strategies With Children and Adolescents (3). Theory and practice of work with children. Focus on youth in transition, protective services and permanency planning, and special needs populations.

390—Undergraduate Field Practicum (6). Supervised social work practice in a school-approved agency focusing on development of direct practice skills. Fall semester, three days per week. Prerequisites: third semester professional program standing; 220, 310, 332, 330, 333, 334, and 320; consent required. Co-requisite: 331 and 398. Graded on S/U basis only.

398—Senior Professional Seminar (3). Integrative professional practice seminar for BSW students focusing on the principles of generic social work and its application to direct practice in diverse fields, career planning and responsibilities. Co-requisites: 331 and 390.

400—Problems (1-6). Intensive study of an area of social welfare related to special interest of student. Prerequisites: graduate standing, consent required.

401—Topics in Social Work (1-3). Special and emerging topics in social work and social welfare. Subject, content, and credit varies depending on available faculty and student interest. Prerequisite: graduate standing; consent required.

403—Independent Study (1-6). Intensive investigation of phenomena germane to area of concentration carried out with guidance of faculty. May include data collection and leads to a writing report in publishable format. Prerequisite: 412 or equivalent and graduate standing required.

404—Research (1-6). Independently conducted research that includes concept development, data collection, statistical analysis and social policy implications prepared in a format suitable for publication. Prerequisite: 412 or equivalent and graduate standing; consent required. Graded on S/U basis only.

410—Social Policy and Service Delivery in Social Work (3). Covers historic and contemporary issues in social welfare policy. It focuses on relationships among social problems, public policies, private actions, proverty, racism, sexism and social work practice/values . Prerequsites: graduate standing; consent required. Letter grading only. f.

411—Advanced Social Policy for Planning and Administration (3). Focus on integration of cognitive and skill components of policy development, analysis and change with special emphasis on utility by social work administrators and planners. Prerequisite: 323; graduate standing; consent required.

412—Family and Child Welfare Policies and Programs (3). Graduate seminar on policies and programs relevant to social work practice in the family and child welfare field, including policies on aging. Prerequisite: completion of first year of graduate program; consent required.

413—Mental Health Policies and Programs (3). Focus is on knowledge of the content, context, history and current trends in mental health policymaking at federal and state levels, and skill building in policy analysis. Prerequisite: graduate standing: consent required. Letter grading only.

414—Issues in Health Care Policy (3). Graduate Seminar focusing on development of skills in social policy analysis. Emphasizes knowledge and analytical perspectives about social policies and health and impacts on various populations. Prerequisites: second year graduate standing; consent required. Letter grading only.

420—Foundations of Human Behavior (3). Substantive sources from behavioral sciences used in social work toward understanding the biosocial processes and constraints of human development. Prerequisite: graduate standing; consent required.

421—Practicum in Cultural Diversity I (1). A practicum conducted on a workshop with content focused on racial, cultural and gender dynamics in social work practice. Prerequisites: graudate standing; consent required. Graded on a S/U basis only.

422—Practicum in Cultural Diversity II (1). Continuation of 492. A practicum conducted as a workshop with content focused on racial, cultural and gender dynamics in social work practice. Prerequisites: graduate standing; consent required. Graded on a S/U basis only.

423—Advanced Foundations of Human Behavior for Clinicians (3). Examines prevailing models of clinical and social classification, with emphasis on strength perspective and social treatment. Prerequisites: graduate standing in social work; consent required.

424—Advanced Foundations of Human Behavior for Administrators (3). Examination of relevant theoretical and behavioral foundations in order that students can acquire the knowledge to function as a social work administrator. Prerequisites: graduate standing; consent required.

430—Generalist Social Work Practice (3). This course develops the generalist approach to social work knowledge, values, systems and processes with emphasis upon the generic aspects of intervention at several levels of social organization. Prerequisite: graduate standing in Social Work; consent required.

431—Community and Organization Dynamics (3). Examination of social environment in which social work is practiced with particular emphasis on development of analytic framework for understanding formal organizations and communities. Prerequisite: graduate standing in Social Work; consent required.

433—Advanced Interaction Skills Workshop (3). Advanced class in social processes and interaction skills basic to generalist social work practice. Learning in cognitive, behavioral and affective domains: including group dynamics, com- munication and social influence theory. Prerequisite: graduate standing in social work.

434—Strategies of Clinical Social Work Intervention (3). Strategies of social treatment with individuals and small groups applicable to practice in public and private social

agency settings. Prerequisites: graduate standing in social work; consent required.

435—Fundamentals of Social Work Administration (3). Basic managerial skills which social workers need for supervision, planning, staff development and administrative positions in social agencies; focus on individual management functions and skills associated with them. Prerequisite: graduate standing; consent required.

436—Social Work Practice in Physical Health Field (3). Designed to prepare students for graduate social work practice across physical health care settings. The focus is on optimizing functioning in the community and the prevention of secondary psychosocial debility. Prerequisite: graduate standing; consent required.

437—Social Work Practice in Mental Health (3). Focus is on social work practice roles applicable in mental health settings, including public and private, institutional and community-based; and substance abuse and developmental disabilities settings. Prerequisites: graduate standing; consent required.

438—Social Work Practice in the Family and Children's Services (3). Focus is on the unique aspects of social work practice with families across the life cycle who seek family centered sevices incommunity-based agencies. Prerequisites: graduate standing; consent required.

439—Management of a Social Agency (3). Basic resource management and control techniques common to social agencies with emphasis on personnel management, information and data managment, and fiscal management. Prerequisites: graduate standing; consent required.

440—Research Methods in Social Work (3). Examines research methodology and design as applied to the study of social work techniques and problems. Emphasizes differential uses of scientific observation and techniques for developing knowledge and improving practice. Prerequisite: completion of first year graduate program; consent required.

441—Evaluative Research in Clinical Social Work Practice (3). Develop ability to systematically evaluate effectiveness of interventive strategies designed to produce positive change in clients environment and/or cognitive, affective and behavioral functioning. Prerequisite: 440; graduate standing; consent required.

442—Evaluative Research in Social Work Planning & Administration (3). Develop ability to design and implement appropriate evaluative research methods and strategies employed in social and human service program planning and management. Prerequisite: 440; graduate standing; consent required.

450—Social Work Interventions in Child Welfare (3). Intensive seminar in direct social work practice in the field of child welfare. Explores most current theory and practice and applications in prevention, protection and restructuring. Prerequisites: graduate standing; consent required.

451—Organizational Issues in Social Work Practices in Child Welfare (3). Intensive seminar in meso-level practice in the filed of child welfare. Examines communication theory, team building, and interorganizational dynamics as they affect professional practice in child welfare. Prerequisties: graduate standing; consent required.

453—Advanced Social Group Work (3). An intensive exposure to the theories and models of social group work practice through cognitive, affective and experiential (laboratory) methods of teaching/learning. Prerequisites: graduate standing; consent required.

454—Family Treatment (3). Comparative study of theories and methods required for work with problems of family functioning. Both conjoint and subsystem approaches to family treatment are examined. Prerequisite: graduate standing; consent required.

456—Law and Social Work Practice (3). Legal processes relevant to social work practice and court procedures and study of decisions affecting social work across specializations. Prerequistie: senior or graduate standing and consent required.

457—Helping Strategies with Older Persons (3). Focus on interdisciplinary methods of assessment and intervention strategies designed to optimize healthy functioning for older persons and their families. Prerequisites: graduate standing; consent required.

458—Supervision, Consultation and Staff Training (3). Philosophy, objectives, principles and methods of social work supervision, staff development and consultation with emphasis on the commonality of the teaching-learning-evaluating functions. Prerequisite: graduate standing; consent required.

490—Graduate Field Practicum I (3-6). Supervised social work practice in a school-approved agency providing a full range of interventive experiences. Winter semester, 2 or 3 days per week. Prerequisites: admission to MSW program, 410, 420, 430, 431, 433; graduate standing; consent required. Graded on S/U basis only.

491—Graduate Field Practicum II (1-13). Field instruction tailored to concentration and specialization interests, developing depth in clinical skills in direct service or planning and administration. Prerequisites: completion of all required graduate coursework except 498; consent required. Co-requisite: 498. Graded on S/U basis only.

498—Professional Practice Seminar I (3). Provides integrative learning experience in social work practice in an area of beginning specialization in autonomous social work practice. Prerequisites: graduate standing; consent required. Corequisite: 491.

Sociology

College of Arts and Science
109 Sociology Building (573) 882-8331
http://www.missouri.edu/~socwww

FACULTY

James L. McCartney, chair, professor, PhD, University of Minnesota. Science studies, social organization, East Asia.

C. Edwin Vaughan, director of graduate studies, professor, PhD, University of Minnesota. Social control and the welfare state, organization, aging.

J. Kenneth Benson, director of undergraduate studies, professor, PhD, University of Texas. Theory, social organization.

Andrew C. Twaddle, professor, PhD, Brown University. Health and sickness, comparative health systems.

Bruce J. Biddle, professor, PhD, University of Michigan. Social psychology, role theory, education.

Edward E. Brent, professor, PhD, University of Minnesota. Methodology, statistics, computer applications.

John F. Galliher, professor, PhD, University of Indiana. Criminology, law, professional ethics.

Donald O. Granberg, professor, PhD, The Pennsylvania State University. Social psychology, intergroup relations, politics.

Robert W. Habenstein, professor emeritus, PhD, University of Chicago. Social theory, qualitative methods, occupations and professions, aging.

Peter M. Hall, professor, PhD, University of Minnesota. Symbolic interaction, political, education, qualitative methodology.

Richard M. Hessler, professor, PhD, University of Pittsburgh. Medical, methodology, sports, aging.

Mary Jo Neitz, professor, PhD, University of Chicago. Religion, gender, culture, qualitative methods.

Ted R. Vaughan, professor emeritus, PhD, University of Texas. Theory, sociology of knowledge.

Barbara J. Bank, associate professor, PhD, University of Iowa. Social psychology, gender, personal relationships, education.

Clarence Y. Lo, associate professor, PhD, University of California-Berkeley. Political, social movements, urban, qualitative/historical methods.

Ibitola O. Pearce, associate professor, PhD, Brown University. Medical sociology, race/class/gender, development.

Joan Hermsen, assistant professor, PhD, University of Maryland-College Park. Sex and gender, stratification/mobility, family.

Ellen Reese, assistant professor, PhD, University of California-Los Angeles. Comparative sociology/historical sociology, political sociology, sex and gender.

Anna Riley, assistant professor, PhD, Washington State University. Race/ethnic/minority relations, social psychology, race/class/gender.

DEGREES: MA and PhD in sociology

The Department of Sociology offers graduate work designed to teach the application of sociological theory and research methodology to the analysis of a range of issues and problems affecting modern societies. At the MA and PhD level, the core of graduate training is in theory and methods. Students may specialize in social psychology, deviance and social control, organizations and occupations, political sociology and social movements, theory and methods, inequality and social policy. Substantive interests (sociology of health, family, religion, gender issues) can be accommodated within those specialty areas.

Financial support for students includes teaching and research assistantships. The application deadline for both the MA and PhD program is January 31 for admission the following August.

MASTER'S DEGREE: To be accepted for advisement to the MA program, the department requires 15 hours of undergraduate sociology with a grade average of B or better, including one course in sociological theory and a basic statistics course. In addition, the applicant must complete an application form, prepare an essay, submit letters of recommendation and submit GRE scores.

The MA in sociology may be taken on a thesis or a non-thesis plan. Both plans require completion of 403, 405, 430, 376, three courses designated as "MA core" and additional course work for a total of 31 (thesis option) or 41 (non-thesis option) hours. Completion of a satisfactory thesis is required for those who wish to be considered for the PhD program.

DOCTORAL DEGREE: To be accepted for advisement in the PhD program, applicants must have a master's degree from this department or one substantially similar in content to that offered here. Applicants who have a master's degree from another sociology department or in another field should expect to take up to 18 hours of course work before entering the PhD program. Students admitted from outside our MA program will meet with the admissions and placement committee during their first semester

of registration for a diagnostic interview, at which time steps to remedy deficiencies will be specified.

The PhD program requires a minimum of 30 hours of course work beyond the MA degree, including two seminars in sociological theory (438 and one other chosen from 439, 440 or 442) and three seminars in sociological research methods (480 and two others chosen from 431, 432 or 441), plus courses targeted to the student's specialty interests. Specialty areas for the PhD degree are the same as those for the MA degree, with the addition of theory and methodology.

All students are required to take a qualifying examination during their first year of PhD work. At least eight months before the date on which they expect to complete the degree, candidates must pass a comprehensive examination. Students must prepare and successfully defend a dissertation that makes an original contribution to the discipline.

COURSES

200—Class, Status, and Power (3). Study of the structure of wealth, poverty, prestige, and power in relationship to societal, interpersonal, and individual opportunities, constraints and outcomes. Prerequisites: 1 or 4 or equivalent.

210—Public Opinion and Communication (3). Nature of public opinion; processes of opinion formation; special publics, pressure groups; effects of communication through personal contacts and mass media; propaganda, censorship; opinion surveying. Prerequisite: 1 or 4 or 50.

211—Criminology (3). Sociology of law; constitutional, psychological, sociological theories of criminal behavior; process of criminal justice; treatment of corrections; control of crime.

214—The Family (3). (same as Rural Sociology 214). Families, kin and households as interacting groups; roles, socialization, problems, structural change; family in relation to other social institutions; historical, cultural and class variations. Prerequisites: 1, 4, 50 or Rural Sociology 1.

215—Collective Behavior (3). (same as Peace Studies 215). Analysis of crowd behavior and related phenomena: rumors, disasters, fashions. Social responses to unclear, dangerous or unjust conditions. The dynamics of conflict, consensus and change. Prerequisites: 1 or 4 or 50.

216—Urban Sociology (3). (same as Rural Sociology 216). Urbanism as a world phenomenon; ecological, demographic characteristics of cities; organization of urban society including status systems, occupational structure, formal and informal associations, racial and cultural relations, forms of communication, housing, city planning. Prerequisites: 1 or 4 or Rural Sociology 1 or equivalent.

217—The Sociology of Sport (3). The role of sport in modern society. Includes violence in sport; politics and economics of sport; male, female, and racial inequalities; and international comparisons of sport structures. Prerequisites: 1 or 4 or 50.

219—Organizations and Institutions (3). Social organization of modern societies with focus on complex organizations (corporations, bureaucracies) within institutional arrangements (economy, polity, education, religion); organizational structure; interorganizational networks; interrelations of institutional sectors. Prerequisite: 1 or 4 or equivalent.

224—Sociology of Health (3). A survey of sociological thinking and research on health, health problems, health occupations and health services. How these are shaped by the society. Problems faced by individuals and the system. Potential solutions to problems. Prerequisite: 110 or junior standing in a health related discipline.

252—Occupations and Professions (3). Analysis of occupational, professional aspects of American society. Division of labor; occupational mobility; work and the self; colleagueship and informal organizations of work. Prerequisites: 1 or 4 or 50.

260—Social Psychology (3). Survey of theories and research concerned with the ways in which individuals construct social situations and are affected by them. Topics covered include self-identities, social influence, personal relationships, prejudice and discrimination. Prerequisites: 1 or 50.

262—Sociology of Sex Roles (3). (same as Women Studies 262). Examination of females and males in contemporary society as they are affected by culture; various institutional arrangements, including the labor market; interactive relationships; socialization; and sexism. Prerequisites: Sociology 1, 60 or equivalent.

270—The Sociology of Religion (3). (same as Rural Sociology 270). Sociology of religious experience, action, organization, movements and social change; contemporary trends, including mainline and new religions, civil religion, secularization. Prerequisite: 1 or 4 or Rural Sociology 1.

282—Senior Seminar (3). Integrates perspectives, methods, substantive foci of undergraduate courses. Analysis of sociology as a discipline and profession. Discussion of opportunities for graduate study, employment. Prerequisite: 180 and 299 and senior sociology major.

285—Social Problems (3). Trends in modern societies: urbanization, occupational structure, technological change, etc. as these have produced alienation and legitimacy problems. Political, economic, health, welfare, military, justice institutions may be considered. Counter movements and policy issues. Prerequisites: 1 or 4 or 50.

290—Practicum (1-9). (same as Rural Sociology 290). Independent research or professional experience under faculty supervision. Project must be arranged by student and faculty member prior to registration. Prerequisites: junior standing and instructor's consent.

295—Service Learning in Sociology (3). Students participate in a variety of research-oriented, community service projects which illuminate and reinforce concepts introduced in various sociology courses. Repeatable twice for credit. Does not meet A&S general education requirements. Prerequisite: instructor's consent. f,w,s.

299—Recent Theories in Sociology (3). (same as Rural Sociology 299). Introduction to major theoretical positions and issues in contemporary American sociology. Logical and intellectual structure of major theoretical schools: functionalism, conflict, exchange, symbolic interaction, phenomenological-ethnomethodological theories. Prerequistite: 110.

301—Topics in Sociology (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent. Prerequisites: junior standing & instructor's consent.

305—Social Demography (3). (same as Rural Sociology 305). General demographic theories; age, sex, and ethnic composition of population; fertility, mortality and migration as components of population change; social, economic and political implications of demographic trends. Prerequisites: 1 or Rural Sociology 1 and junior standing.

310—Social Inequalities (3). Examination of theories and research concerned with inequalities based on social class, gender, and race-ethnicity. M.A. core course for sociology students. Prerequisite: graduate standing or instructor's consent.

311—Sociology of Social Policy (3). (same as Rural Sociology 311). Sociological theories and methodologies focused on social policy; policy as process; contextual and critical policy analyses; assessing policy effects and consequences. Prerequisite: senior standing.

312—Contemporary Corrections (3). Development of concepts of punishment, treatment. Contemporary penal and correctional institutions; problems of custody, classification, education, industry and treatment program; probation, parole. Prerequisites: 110 and 211 or graduate standing.

319—Society and Social Control (3). The concept of social control is analyzed from both micro and macro theoretical perspectives. Focus is on patterns of social domination. MA core course. Prerequisite: 219 or 252 or graduate standing.

321—Expert Systems (3). (same as Computer Science, Veterinary Medicine & Surgery and Anthropology 321). Introduction to the use of expert system shells, designed for graduate students from any department. Students create prototype expert systems under close supervision by faculty experts. Prerequisite: departmental consent.

322—Sociology of Aging (3). Sociological research and theories of aging and old age; historical, demographic, comparative, social psychological and structural topics are studied in depth. Prerequisites: 6 hours of Sociology and junior standing.

323—Death and Dying (3). Death and dying explored from demographic, sociological and social psychological perspectives. Topics: trends and differentials; definitions of death; dying as a social process; funerals and survivors; cultural solutions to problems of death. Prerequisite: instructor's consent. w.

324—Sociology of Health Systems (3). Analyzes organization of U.S. health system and systems in the developed and developing world. Special attention to reform movements, universality, effectiveness, quality, and efficiency. Prerequisite: 180, 224, and 299 or graduate standing.

333—Social Organization (3). Survey of approaches to the analysis of social organization emphasizing complex organizations, division of labor, social inequality, politics and the state, social change. MA core course. Prerequisite: 219 or 252 or graduate standing or instructor's consent.

335—Social Change and Trends (3). (same as Rural Sociology 335). Nature of social change. Emphasis on sociological theories and models of social change and thier application in analysis and implementation of change in social structures.

336—Social Movements and Conflicts (3). Survey of approaches and research on social movements and social change. Historical and contemporary social movements in the U.S.; collective protest and violence; political revolutions. MA core course. Prerequisite: 215, 219, or 262 or graduate standing.

337—Race and Ethnic Relations (3). The experience of racial and ethnic minorities; inequality, assimilation, ethnic and racial conflict, accomodation. Prerequisites: 1 or 4 or equivalent and junior standing.

343—Advanced Social Psychology (3). Major theoretical fields and their application to human problems. M.A. core course. Prerequisite: 260 or graduate standing.

344—Group Dynamics and Role Theory (3). (same as Psychology 344). Detailed investigation of one or more theoretical and experimental area in social psychology.

345—Self, Identity and Interaction (3). Consequences of social interaction on self and identity development. Sociological research on self-concept, self-esteem, identity research, self-verification, self-discrepancy theory and social identity theory. Prerequisite: 260 or graduate standing.

346—Structure of Interpersonal Behavior (3). (same as Psychology 346). Patterns and processes of social interaction and interpersonal relationships. Analysis of such topics as communication, non-verbal behavior, empathy, impression management, love, intimacy, life cycle of relation- ships. Prerequisites: 260 or instructor's consent.

350—Special Readings (1-99). Extensive reading in selected area or special field. Prerequisites: 12 hours Sociology & departmental consent.

354—Political Sociology (3). (same as Peace Studies 354). Social bases of power and politics, economic and political elites, the political- economy of the advanced societies, sources of political conflict and change. MA core

course. Prerequisite: 200, 210, 215, or 219 or graduate standing.

355—Sociology of Education (3). (same as Education Studies B355). Contexts, structures and processes of schooling; effects on class, race, ethnicity and gender; social change, educational policy, and organizational dynamics; higher education and the economy. Prerequisites: 1 or equivalent.

362—Feminist Research and Criticism (3). Examination of both feminist critiques of traditional social research and recent, feminist-oriented research that attempts to answer these criticisms. Prerequisites: 180 or equivalent.

371—Attitude Change (3). (same as Psychology 371).

372—Social Organization of the Industrial Societies (3). The organizational and interorganizational structure of modern capitalist and socialist societies, including examination of alternative models such as technocracy, bureaucratic society, state capitalism, state socialism, organized capitalism. Prerequisites: 219 or 252 or graduate standing.

373—Global Perspectives on Women and Development (3). (same as Black Studies and Women Studies 373. Examines the history and structure of "development" discourse and practices. Stresses the interconnections and impact on women globally. Reviews women's strategies in defining and instituting programs to improve quality of life in communities. Prerequisites: Sociology 110, Women Studies 111, Black Studies 111, or Women Studies 370.

375—Social Statistics (3). (same as Rural Sociology 375). Descriptive statistics and bivariate quantitative analysis techniques commonly used by social scientists. Includes coverage of parametric and non-parametric methods. Introduction to computer analysis. Prerequisite: 180 or graduate standing.

376—Advanced Social Statistics (3). (same as Rural Sociology 376). Introduction to multivariate analysis for social scientists. Emphasis on non-experimental applications of analysis of variance and correlation-regression. Computer applications emphasized. Prerequisite: 375 orequivalent.

400—Problems (1-99). Directed research not leading to thesis or dissertation. Prerequisites: 12 hours Sociology & departmental consent.

403—Professional Problems (1). Problems of teaching, non-academic employment professional organization, ethics. Required of all M.A. and Ph.D. candidates new to the program.

405—Theories of Society (3). Fundamental theoretical developments in modern sociology seen as an empirical discipline. Required for M.A. students. Prerequisites: graduate standing or instructor's consent.

406—Seminar in Social and Economic Development (3). (same as Rural Sociology 406). Analysis of world economy and societal development: assessment of contemporary and historical bases of international economic and political stratification.

409—Seminar in State and Economy (3). Analysis of public policy and economic change in contemporary political-economic systems; growth of welfare state, capitalist planning, state socialist economics.

410—Seminar in Comparative Social Institutions (3). Analysis of selected social institutions such as agriculture, family, economy, education, health care, law, polity, religion. Inter-institutional and international comparisons. Prerequisites: 333 or instructor's consent.

411—Seminar in Sociology of Work (3). Recent developments in the sociological study of occupations and professions. Surveys alternative theoretical perspectives and methodological approaches. Deals with rationalization, professionalization, alienation, class consciousness, self-management.

412—Seminar in Sociology of Organizations (3). Recent developments in the sociological analysis of complex organizations, including corporations, public bureaucracies, educational organizations, religious organizations, etc. Surveys alternative theoretical perspectives and methodological approaches.

415—Seminar in Family Sociology (3). Research and theory on family structure and family life; in-depth study of a selection of topics and issues. Prerequisites: 369 or 322 or 346 or instructor's consent.

420—Independent Readings in Preparation f/Comprehensive Examinations (1-6). Independent readings for PhD comprehensives. Open only to PhD candidates who have passed qualifying examinations. Prerequisite: consent of major advisor.

425—Communication and the Diffusion of Information (3). (same as Rural Sociology 425). Factors conditioning communication and diffusion of ideas and practices; exercise of personal influence; role of change agents and agencies in the process ofchange.

429—Seminar in Criminology and Deviant Behavior (3). Survey of empirical research and sociological theory in criminology and deviant behavior. May be repeated once with instructor's consent. Prerequisites: 211 & graduate standing or instructor's consent.

430—Research Methodology (3). Meta-theoretical and conceptual issues at the core of design decision making, questionnaire construction, qualitative field techniques, interviewing, scaling, panel analysis, computer applications to qualitative data; experimental, survey and case study designs, ethics. Required for M.A. students.

431—Seminar in Multivariate Analysis Techniques (3). (same as Rural Sociology 431). Examination of various qualitative techniques of data analysis. Prerequisites: 430 or instructor's consent.

432—Seminar in Qualitative Methods in Sociology (3). (same as Rural Sociology 432). Examination of various qualita- tive methods of research, including problem-formulation, access and interpretation of data, theory-generation, and preparation of research reports. Prerequisites: 430 or instructor's consent.

433—Seminar in Social Psychology I (3). (same as Psychology 433). Intensive review of concepts and theories of social psychology; emphasizes readings from primary sources. Ph.D. candidates only.

438—Seminar in Sociological Theory I (3). Traces development of sociological theory from the "generation of 1890" through the 1940s, including the work of Durkheim, Weber, Parsons and others. Prerequisite: 405 or equivalent.

439—Seminar in Sociological Theory II (3). Theoretical developments in sociology in Europe and United States since 1950. Recent formulations, controversies. Prerequisite: 405 or equivalent.

440—Topical Seminar in Contemporary Sociological Theory (3). Critical evaluation of selected points of view in current sociological theory. May be repeated with departmental consent. Prerequisite: 405 or equivalent.

441—Topical Seminar in Historical Sociology (3). Methodological approaches to sociological explanation of historical phenomena; related sociological theories of historical development, including Weberian, Marxist and other perspectives applied to a topical historical problem. Prerequisite: 405 or equivalent.

442—Seminar in Sociological Theory Construction (3). Philosophy and structure of science, critical examination of selected methods, models and theories with special concern for theory construction. Prerequisite: 405 or equivalent.

446—Community Social Structure (3). (same as Rural Sociology 446). A comparative study of communities in different nations and in urban and rural areas. A primary focus of the course will be on social change in communities, in response to changing economic, political, social, cultural, and ecological factors.

450—Research (1-6). Research not expected to terminate in thesis or dissertation. Prerequisite: instructor's consent.

462—Seminar in Sociology of Gender (3). Analysis of recent research in which gender is a major focus. This research is chosen to exemplify a variety of theoretical perspectives, research strategies, and substantive topics.

470—Social Interaction Research (3). (same as Psychology 470).

480—Seminar in Sociological Reasoning and Research Development (3). Systematic development of sociological research integrating theory, method, and contributions to knowledge. Formulations of sociological problems, conceptual frameworks, research programs analytical stratgies. Prerequisites: 430 or equivalent, doctoral standing.

490—Research (1-99). Advanced work leading to thesis or dissertation. Prerequisite: consent of major advisor. Graded on a S/U basis only.

Soil and Atmospheric Sciences

School of Natural Resources
College of Agriculture, Food and Natural Resources
116 Gentry Hall, Columbia, MO 65211
(573) 882-6591

FACULTY

R. David Hammer, department chair, professor, PhD, University of Tennessee. Soil genesis and classification.

Stephen H. Anderson, director of graduate studies, associate professor, PhD, North Carolina State University. Soil physics.

Frieda Eivazi, adjunct associate professor, PhD, Iowa State University. Soil biochemistry and fertility.

Clark J. Gantzer, associate professor, PhD, University of Minnesota. Soil conservation.

Diann Jordan, associate professor, PhD, Michigan State University. Soil microbiology.

Robert J. Kremer, adjunct associate professor, PhD, Mississippi State University. Soil microbiology.

Randall J. Miles, associate professor, PhD, Texas A&M University. Soil genesis and mineralogy.

Stephen E. Mudrick, associate professor, PhD, Massachusetts Institute of Technology. Meteorology.

E. Eugene Alberts, adjunct assistant professor, PhD, Purdue University. Soil and water conservation.

Newell R. Kitchen, adjunct assistant professor, PhD, Colorado State University. Soil fertility.

Robert N. Lerch, adjunct assistant professor, PhD, Colorado State University. Soil biochemistry.

Anthony R. Lupo, assistant professor, PhD, Purdue University. Atmospheric dynamics.

Peter P. Motavalli, assistant professor, PhD, Cornell University. Soil fertility.

Gary D. Willson, adjunct assistant professor, PhD, University of Nebraska. Ecology.

DEGREES: MS and PhD in soil and atmospheric sciences.

Soil and atmospheric science graduate programs are designed to prepare students for professional careers in research, teaching or application of basic concepts of soil and atmospheric sciences to air-plant-soil-water problems. Candidates for the MS degree must have a baccalaureate degree from an accredited college. Appropriate undergraduate majors in preparation for graduate studies in soil and atmospheric sciences include: agronomy, atmospheric science, biochemistry,

biology, botany, chemistry, earth science, engineering, environmental science, forestry, geology, mathematics, microbiology, physics, soil science and statistics.

Atmospheric science students participate in an area of research such as dynamical and physical meteorology, general circulation, global climate change, severe storms, and bioclimatology and applied climatology with emphasis on environmental and socioeconomic impacts. The department has a specialized computer data library that includes extensive long-term global and local observational records to support thesis and dissertation research. There are opportunities for joint research programs with the Graduate Center for Cloud Physics at the University of Missouri-Rolla and the National Center for Atmospheric Research.

Soil science students participate in one of the following emphasis areas: environmental quality, pedology and soil mineralogy, soil chemistry and biochemistry, soil physics and conservation, or soil fertility and soil-plant relationships. Equipment for chemical, microbial and physical analysis of soils are maintained by the School of Natural Resources. Access to additional chemical analysis equipment, computing facilities, digital imaging equipment, field facilities, greenhouse space, radiochemistry and scanning electron microscopes are available within the University.

MASTER'S DEGREE: To be accepted for advisement in the atmospheric science program, a student's undergraduate program should include integral calculus and one year of college physics. Students entering the soil science program should have completed courses in general and organic chemistry, calculus, geology and physics. Applicants should provide a letter of self-evaluation, official transcripts of all course work, letters of reference and GRE scores. A TOEFL score is required from international applicants. Inadequacies in courses must be remedied through additional course work immediately after admission. The degree program must include 30 hours of graduate credit, with at least 15 hours of these being in 400-level courses. Not more than 12 of the minimum 30 hours is permitted for research, problems, special investigations and special readings. At least 12 credit hours of soil science courses at the 300 and 400 level exclusive of problems and thesis research must be included in the student's graduate program in soil science. A minimum of one credit hour of graduate seminar must be included in the student's graduate program. All students enrolled in the soil science program are required to participate in a supervised teaching activity. Students must maintain a GPA of 3.0 (A=4.0) in all course work presented for the degree. All MS programs in atmospheric science require completion of a thesis. Most MS programs in soil science also require completion of a thesis. Under special circumstances, a non-thesis program in soil science may be approved by the student's advisory committee and the director of graduate studies.

DOCTORAL DEGREE: A student may be accepted for advisement in the PhD program after completion of an MS degree or its equivalent. A waiver of the MS degree requirement may be made by the candidate's doctoral program committee. Applicants should provide a letter of self-evaluation, official transcripts of all course work, letters of reference and GRE scores. A TOEFL score is required from international applicants. The student shall take the qualifying examination soon after admission into the PhD program. The curriculum is developed by a doctoral program committee and requires a minimum of 72 semester hours beyond the baccalaureate degree. At least 15 hours of course work in the degree program must be at the 400 level, exclusive of research, problems and independent study experiences. At least 12 credit hours of soil science courses at the 300 and 400 level exclusive of problems and thesis research must be included in the student's graduate program in soil science. A minimum of two credit hours of graduate seminar must be included in the student's graduate program. All students enrolled in the soil science program are required to participate in a supervised teaching activity. After successfully completing the required course work with a GPA of 3.0 (A=4.0) or better, students must pass a comprehensive examination administered by their doctoral program committee. A dissertation, which is a comprehensive report of original research on a specialized soil or atmospheric science problem conducted by the student, must be presented to the committee and successfully defended.

For additional information write or call the Director of Soil and Atmospheric Sciences Graduate Studies, 116 Gentry Hall, Columbia, MO 65211, (573) 882-6591.

COURSES

ATMOSPHERIC SCIENCE

200—Independent Study in Atmospheric Science (1-3). Independent study of a topic dealing with meteorological theory or application of meteorological science to the solution of relevant problem. Prerequisites: upper-level standing, 50 or equivalent, and instructor's consent. f,w,s.

301—Topics in Atmospheric Science (1-99). Development of theory and applications for selected topics in atmospheric science. Prerequisites: junior standing and instructor's consent.

302—Daily Analysis and Forecast Interpretation (3). A Capstone experience. In depth daily analysis and interpretation by students of the current and forecast states of the atmosphere. Discussions of implications to specific weather sensitive activities. Writing intensive. Prerequisite: senior or graduate Atmospheric Science major.

303—Meteorology of the Biosphere (3). (same as Geography 303). Energy balance of biological systems including plant canopies, forests and animals. Effects of weather events on plant and animal production discussed. Prerequisites: 50, graduate standing or instructor's consent. w.

304—Meteorological Analysis I (4). Meteorological Data. Basic techniques for surface and upper air analysis, using selected examples of weather patterns. Prerequisites: 50, Mathematics 175 (C or better), one college physics course (pre or corequisite). f, odd yrs.

305—Meteorological Analysis II (4). Graphical analysis and interpretation of physical, kinematical and dynamical properties of the atmosphere. Analysis techniques applicable to atmospheric research. Prerequisite: 304 or equivalent. w, even yrs.

307—Atmospheric Phenomena in Physical and Earth Science Instruction (3). Description of atmospheric processes using lecture and simple laboratory activities for science teachers. Prerequisite: Upper division or graduate student standing. s.

312—Remote Sensing for Meteorology & Natural Resource (3). Principles of remote sensing with emphasis on the properties of atmosphere and the earth's surface from airborne and satellite sensors. The techniques for using geosynchronous and orbiting satellite platforms for assessing weather and natural resource features. Prerequisites: junior standing or above, college algebra and trigonometry, Computer Science 75 or Agriculture 111.

314—Atmospheric Physics (3). Physics of atmospheric nucleation-condensation, cloud droplet and precipitation formation, associated electrical phenomena, radiation transfer and remote sensing. Prerequisites: 1 year of college Physics and Mathematics 175. f, alt years.

350—Fundamentals of Meteorology (3). Comprehensive review of fundamental concepts and major developments of modern meteorology; introduces basic physical and dynamic processes of the atmosphere. Prerequisites: Mathematics 175 & Physics 175. f.

356—Micrometeorology (3). Study of transport processes in the surface boundary layer. Important applications in pollution will be discussed. Prerequisite: Atmospheric Science 350.

366—Climates of the World (3). (same as Gergraphy 366). A study of the world distribution of climates based on "cause and effect" relationships. Special attention is given to the impacts of climate on humanity. Prerequisites: 50 or equivalent or graduate standing. w.

390—Internship in Meteorology (1-6). Practical professional work experience with professional or scientific meteorologists in off-campus work environment. Prerequisites: junior standing, 12 hours Atmospheric Science. 2.0 G.P.A.

394—Atmospheric Thermodynamics (4). Thermodynamics of dry and moist air, atmospheric hydrostatics, convection, and development of the fundamental equations of geophysical fluid dynamics. Prerequisites: 50, Math 175 and Physics 175 or instructor's consent. f, even years.

395—Atmospheric Dynamics (4). Dynamics and kinematics of atmospheric flow. Manipulation of fundamental equations, numerical modeling of atmosphere. Prerequisite: 392. w, odd years.

399—Long-Range Forecasting (3). Physical-dynamical principles of long-range forecasting from a month to a year. Empirical and numerical approaches in forecast practice. Prerequisite: 350 or 366.

400—Problems (1-99). Independent study by graduate students in atmospheric science. Prerequisites: graduate standing and instructor's consent. f,w,s.

401—Topics in Atmospheric Science (1-99). Development of the theory with its application for selected topics in atmospheric science. Prerequisites: graduate standing and instructor's consent.

402—Radiation in the Atmosphere (3). Physics of solar and infrared radiative transfer in the atmosphere, including energy conversion effects, atmospheric optics, and photochemical processes. Prerequisites: 1 year College Physics and Mathematics 175. alt. w, even years.

410—Seminar (1-99). Prerequisite: graduate standing. f,w.

412—Advanced Dynamic Meteorology (3). Application of perturbation dynamics, advanced dynamics, and numerical methods to study of atmospheric circulations. Prerequisite: 393. alt. w, odd years.

416—Atmospheric General Circulation (3). Comprehensive review of dynamical theories of general circulation with intensive discussion of current problems. Prerequisites: 393 or instructor's consent. alt. f, odd years.

420—Meteorological Statistics (3). Applies theory of probability and frequency distribution to meteorological variables. Prerequisites: 350 or Statistics 320 or instructor's consent. alt. f, odd years.

466—Advanced Dynamic Climatology (3). Study of global

climate; application of large scale atmospheric dynamics; conservation of various forms of energy, climatic evaluation, large scale climatic modification. Prerequisites: 393 and 416 or 366, or instructor's consent. alt. w, even years.

490—Research (1-99.9). Research for thesis preparation. Graded on a S/U basis only. f,w,s

SOIL SCIENCE

200—Problems in Soil Science (1-99). Special individualized research projects or readings in soil science. f,w,s.

201—Topics (1-99). Organized study of selected topics in soil science. Intended for undergraduates. f,w,s.

280—Soil Classification (2). One four-hour lab section per week. Soil and land classification systems with heavy emphasis on the U.S. Soil Taxonomy. Study of the soil orders through the Great Group level. Students will learn to classify soils from descriptions and data. Introductory soil science or instructor's consent. w, odd.

300—Problems (1-99). Special individualized non-thesis research projects or readings in soil science. f,w,s.

301—Topics (1-99). Organized study of selected topics in soil science. Intended for upper division undergraduate and graduate students. f,w,s.

307—Soil Physics (5). Study of the physical properties of soils and theory and methodology of selected instrumentationfor the evaluation of those properties. Topics include soil solids, water, solutes, aeration, and temperature. Prerequisites: 100, Physics 21 or equivalent. f.

308—Soil Conservation (3). Conservation of soil with respect to topsoil, soil productivity, and fertility. Prerequisite: 100. Recommended: Agricultural Systems Management 201. w.

312—Soil Microbiology (2). Microbiology/Ecology of life inthe soil Ecosystem. Emphasis is placed on the role of microbes in nutrient cycles, microbial pesticide transformations, etc. Prerequisite: General soils 100 or instructor's consent.

313—Soil Fertility and Plant Nutrition (3). (same as Plant Science 313). Explanation of principles of delivery of plant nutrients to plants, discussion of the role of each essential nutrient in crop plants and introduction to the management of soil amendments. Prerequisites: junior standing, Mathematics 10, beginning soil science, 5 hours of plant science and 5 hour college chemistry.

314—Soil Fertility and Plant Nutrition Laboratory (2). The application of elementary analytical procedures to the evaluation of the nutrient status of soils and crop plants. Prerequisite: concurrent or previousenrollment in 313. w.

316—Soil Microbial Ecology Methods (1). The application of modern andtraditional techniques in soil microbiology to environmental and ecological concerns. Prerequisites: concurrent with 312.

318—Environmental Soil Chemistry (3). Application of chemical kinetic, solubility, and mobility principles in air-soil-water systems to environmental problems. Prerequisites: 106 and organic chemistry. f.

320—Genesis of Soil Landscape (4). The co-evolution of soillandscapes. The role of water in the accumulation of parent materials and development of soil horizons. Factors andprocesses of soil genesis. Distribution Distribution of soil in their natural settings. Prerequisites: introductory soil science orintroductory geology or permission of instructor. w, odd yrs.

388—Soil-Plant Relationships (3). Discussions of the interactions occurring in the soil-plant environment continuum as plants grow. Prerequisites: 18 hours of college level natural science or natural resource courses including introductory soil and plant science

400—Problems (1-99). Special individualized non-thesis research projects or reading in soil science. f,w,s.

401—Topics (1-99). Organized study of selected topics in soil science. Intended for graduate students in soil science. f,w,s.

407—Advanced Soil Physics (3). Transport of mass and energythrough soil with emphasis on development of the equations offlow. Evaluation of analytical and numerical solutions to differential equations describing transport phenomena. Prerequisites: 307, Mathematics 304, or equivalent. alt. w, odd years.

410—Seminar (1). In-depth development of advanced aspects of soil science through reviews of results of research in progress and current scientific publications.

414—Advanced Soil Fertility (3). History and application of concepts of fertility and plant nutr nutrition. Prerequisites: 313 and Plant Science 315 or equivalent, 14 hours of college chemistry andfive hours of calculus.

418—Soil Chemistry (3). (same as Plant Science 418). Equilibrium, kinetic, and biological principles describing mineral solubility and transformations in soil-water-plant systems. Prerequisites: Plant science 418 or Geology 342, and Chemistry 230. f.

420—Pedology (3). Three one-hour lectures.Detailed study of processes of soil horizonization and current topics in soil genesis including quantitative assessment of spatial and temporal variability and application of GIS in landuse planning. Prerequisites: Soils 320, one statistics course beyond ANOVA. w, even yrs.

450—Nonthesis Research (1-9). Research not expect to terminate in dissertation. f,w,s

490—Thesis Research (1-10). Original investigations in soil science in support of thesis for master's and doctoral candidates. Graded on a S/U basis only. f,w,s

South Asia Language and Area Studies

437 General Classroom Building (573) 882-3065

FACULTY

Bina Gupta, chair, professor of philosophy and South Asian languages, PhD, Southern Illinois University.

Gerald N. Barrier, professor of history, PhD, Duke University.

Robert Bussabarger, professor emeritus of art, MA, Michigan State University.

Peter Gardner, professor of anthropology, PhD, University of Pennsylvania.

Arthur Robins, professor emeritus of psychiatry, PhD, University of Minnesota.

Paul Wallace, professor of political science, PhD, University of California-Berkeley.

Joel Brereton, associate professor of religious studies, PhD, Yale University.

Pushpajit Bhullar, international librarian, MLS, University of Missouri-Columbia.

The South Asia Language and Area Center provides a focus for a student who wishes to pursue specialization in South Asian studies at the MA or PhD level. Graduate degrees are pursued through the departments that relate to the center. Besides the graduate degree, a certificate of specialization is awarded with degrees in specific disciplines.

The participating departments are anthropology, geography, history, philosophy, political science and religious studies. The South Asian languages offered are Hindi and Sanskrit.

The University is a member of the American Institute of Indian Studies, a consortium and funding agency for the leading South Asia Centers in this country.

Individual departments offer financial assistance. The library has been developed under the supervision of a professional South Asian librarian. The library was a recipient of books published in South Asia under the P.L. 480 program. Particularly notable is the broad selection of books and microfilm on the Punjab area of South Asia. A collection of South Asian works of art is in the Museum of Art and Archaeology.

REQUIREMENTS: Students must fulfill the degree requirements of the department through which they pursue their graduate degrees, and are expected to prepare themselves in language and area subjects beyond departmental requirements. Remaining requirements are established to provide maximum flexibility to the student's goals and previous training. The object is to provide both depth and breadth and a meaningful exposure to the area on an interdisciplinary basis. Advisers also may require additional courses to supplement the candidate's undergraduate preparation in Asian studies.

Minimum South Asian courses for the MA degree are two years of a South Asian language and one minor field in South Asia (minimum six credits).

PhD candidates must complete at least three years of a South Asian language, a minor field (minimum of six credits) and six elective credits in courses to be chosen from outside the major and minor fields.

COURSES

203—Advanced Hindi Readings I (4). Directed readings in the literature of the student's area of concentration, and advanced conversation.

204—Advanced Hindi Readings II (4). Continuation of 203.

233—Buddhism of South and Southeast Asia (3). (same as Religious Studies 233). Examines the origins of Buddhism in India, the narratives of the life of the Buddha, the development of early Buddist schools, the extension of Buddhism into Central and Southeast Asia, and the current practice of Buddhism in South and Southest Asia. Prerequisites: sophomore standing or instructor's consent.

245—Nonviolence in the Modern World (3). (same as History 245 and Peace Studies 245). Readings on recent world history, emphasis on Ghandi and nonviolent tradition in America, Europe and the Third World. Prerequisite: sophomore standing, writing intensive course.

282—History of British India (3). (same as History 282) Introduction to traditional India, the Muslim experience; European rivalry and British hegemony; problems of Crown rule; social and political reforms in the making of modern India.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

330—Religious Narratives of South Asia (3). (same as Religious Studies 330). Study of major narratives of India and their interpretation in literature and art. Topics include: Vedic and Epic mythology, stories of Krishna, myths and images of Shiva, and forms of the Goddess. Prerequisites: 130, 232, 233, or junior standing, or permission of instructor.

350—Special Readings in South Asian Languages (1-6). Individual advanced study of desired South Asian language. Prerequisite: two years of South Asian languages.

360—Asian Philosophy (3). (same as Philosophy 360).

362—Philosophy of India (3). (same as Philosophy 362).

364—Contemporary Indian Philosophy (3). (same as Philosophy 364).

371—Southeast Asia (3). (same as Geography 371).

372—Geography of South Asia (3). (same as Geography

372).

374—Politics in India and South Asia (3). (same as Political Science 374).

384—Religion and Politics in Modern India, 1857-1947 (3). (same as History 384).

400—Problems (3). (same as History 400).

421—Religious Texts and Interpretation: The Veda (3). (same as Religous Studies 421). This course examines the Veda, the foundational scripture of Hinduism. It includes close study of Vedic texts and rituals and the influence, interpretation, and application of the Veda in the later Hinduism. Prerequisite: graduate status or instructor's permission. f, alt yrs.

474—Problems of South Asia (3). (same as Political Science 474).

475—Indian Philosophy (3). Reality, levels of being, status of the world, nature of know- ledge in Indian philosophy in relation the Advaita Vedanta sys- tem of Samkara. Prerequisite: graduate standing.

Special Education

College of Education
380 McReynolds (573) 882-3741
Fax [573] 884=0520
http://www.coe.missouri.edu/~spedwww

FACULTY

Michael Pullis, chair, associate professor, PhD, University of California-Los Angeles. Behavior disorders.

Timothy Lewis, director of graduate studies, associate professor, PhD, University of Oregon. Behavior disorders and mental retardation.

Reuben Altman, professor, PhD, University of Texas. Mental retardation and giftedness.

James E. Leigh, professor, PhD, University of Southern California. Learning disabilities.

Sharon Huntze, assistant professor, EdD, University of Missouri-Columbia. Behavior disorders.

Rebecca McCathren, assistant professor, PhD, Vanderbilt University. Early childhood special education.

Mary Rozendal, assistant professor, PhD, Michigan State University. Mild/moderate disabilities.

Melissa Stormont, assistant professor, PhD, Purdue University. Mild/moderate disabilities.

DEGREES: MA or M Ed in special education, with emphasis areas in behavior disorders, curriculum development for students with exceptionalities, early-childhood special education, general special education, learning disabilities, mental retardation learning and instruction; EdSp in special education with an emphasis area in general special education; EdD or PhD in special education with emphasis areas in administration and supervision of special education, behavior disorders, curriculum development for students with exceptionalities, early-childhood special education, general special education, learning disabilities and mental retardation.

These graduate programs prepare teachers and leadership personnel in the field of special education. Program graduates assume roles as teachers in a variety of educational settings, consulting teachers, college professors, researchers, school administrators, and leaders in state and federal governmental agencies. Programs meet students' needs and interests within the framework of the requirements of each specific degree and state certification guidelines.

See **Education** for general information.

IMPORTANT NOTE: As this catalog goes to press, the Department of Special Education is in the process of revamping its departmental offerings. New graduate level initial certification programs are being designed in the areas of behavioral disorders, early childhood special needs, gifted, learning disabilities, mental retardation and cross-categorical special education. **It is important for applicants to contact the department to determine specific program requirements.**

GENERAL ADMISSIONS POLICY: Faculty selection committees review applications for admission into the various graduate programs. Factors considered in the review process include: previous academic course work and performance, GRE scores, letters of recommendation from professors or professional supervisors, and relevant professional work experiences. In addition, the applicant is to submit a letter of intent and professional goals to be reviewed by the committee. This statement is evaluated for advising purposes and is an indication of the applicant's motivation, professionalism and writing competencies. Interviews with faculty are often arranged as part of the admissions review process.

International students whose native language is not English are required to present a minimum score of 500 on the Test of English as a Foreign Language (TOEFL).

For additional information write or call the Director of Graduate Studies in Special Education, 380 McReynolds, Columbia, MO 65211, (573) 882-3741.

COURSES

L311—Introduction to Special Education (3). Introductory overview of the field of special education; historical developments, characteristics of special populations, and compliance with state and federal regulations.

L312—Introduction to Special Education for Regular Educators (3). Introduction to the field of special education for other majors; survey of exceptionalities with emphasis on the mainstreaming exceptional students.

L322—Behavioral Management for Exceptional Students (3). Study of classroom management and applied behavior analysis strategies. Focus on teacher as decision-maker in the design, implementation, evaluation of individual and group management programs. Prerequisite: L311. Concurrent L323, L324, L325. w.

L323—Instructional Methods and Technology for Exceptional Students (3). Study of direct instructional models as applied to academic and functional skills. Examination of instructional materials, media, technology applied to instruction of exceptional students. Prerequisite: L311. Concurrent with L322, L324, L325. w.

L324—Assessment and Evaluation in Special Education (3). Procedures and instruments used in the assessment of individual with disabilities, including standardized and non-standardized measures of intellectual ability, academic achievement, oral language, social/emotional behaviors, career/vocational needs. Prerequisite: L311; concurrent: L322, L323, L324, L325.

L325—Basic Skills Block Field Experience (3). Field experience in a special education classroom; application of information and approaches covered in classes L322, L323, and L324 in which concurrently enrolled. Prerequisite: L311.

L331—Language Development of Exceptional Students (3). Study of language and communication issues and disorders in special education; normal and atypical language development; language assessment and intervention models and programs. Prerequisite: L322, L324, L325; concurrent: L332.

L332—Collaboration and Consultation in Special Education (3). Study of communication, problem-solving, collaboration strategies. Application of strategies to work with exceptional students, their families, other professional members of interdisdiplinary, interagency teams. Prerequisites: L311, L322, L323, L324, L325. Concurrent. L331. f.

L341—Students w/Mental Retardation & Severe Developmental Disabilities (3). Historic and contemporary influences and events in the field of mental retardation from mild thru severely handicapped; operational technology, population characteristics, litigation and legislation, and service provisions. Prerequisite: L331, L332; concurrent: L333, L342.

L342—Students w/Mental Retardation & Severe Developmental Disabilities (3-4). Practicum concurrent with L341; application of skills acquired in L322-L324 to the characteristics and needs of specific handicapped population. Prerequisite: L331, L332; concurrent: L341.

L343—Students with Behavioral Disorders (3). Issues and needs unique to measurement, management, instruction conferencing, IEP development specific to this population. Prerequisites: L341, L342; concurrent: L344, L345, L346.

L344—Practicum: Students with Behavioral Disorders (3). Practicum taken concurrently with L343; application of skills acquired in L321-L325 to the characteristics and needs of a specific handicapped population. Prerequisites: L341, L342; concurrent: L344, L345, L346.

L345—Students With Learning Disabilities (3). Historic developments, definitions, basic concepts, legislation characteristics, and information and issues pertaining to assessment and programming in the field of learning disabilities. Prerequisites: L341, L342; concurrent: L343, L344, L346.

L346—Practicum: Students with Learning Disabilities (3). Practicum taken concurrent with L345; application of skills acquired in L321-L325 to the characteristics and needs of a specific handicapped population. Prerequisite: L341, L342 concurrent: L343, L344, L345.

L351—Assessment of Functional Skills of Students w/ Severe Disabilities (3). Trains prospective teachers in standardized and criterion- referenced methods of assessment in various curriculum areas for moderately and severely handicapped students. Opportunities to apply various assessment techniques. Prerequisites: L322, L323, L324, L325; concurrent: L331, L332.

L352—Curriculum for Persons With Severe Disabilities (3). Study of development and implementation of functional, age-appropriate, community-referenced curriculum for persons with severe handicaps. Curriculum goals and instructional strategies in community access, domestic, vocational, recreation skills. Prerequisite : L331, L332, L351; concurrent: L341, L342.

L353—Managing Health Related Problems of Handicapped Students (3). Provides prospective teachers, rehabilitation personnel, and recreation specialists with information regarding managing the health problems of the handicapped person. Emphasis is on the provision of services within an integrated therapy model. Prerequisites: L341, L342, L352; Concurrent: L343, L344, L354.

L354—Augmentative Communication for Persons With Severe Disabilities (3). Aided and unaided augmentative communication systems and nonspeech systems; techniques of teaching functional communication programs. Prerequisite: L341, L342, L352; concurrent: L343, L344, L353.

L360—Topics in Special Education (3). In-depth study of

certain developments, findings, trends and issues in one or more areas of special education. Prerequisite: Educational & Counseling Psychology A205.

L371—Vocational Education for Handicapped Students (3). (same as C&I F371). Provides a non-categorical orientation to secondary and post-secondary level vocational programming for handicapped students. Prerequisite: L339.

L372—Methods in Vocational Education for the Disabled & Disadvantaged (3). (same as C&I F372). Study of legislation, interagency cooperation, curriculum, transition, evaluation/grading role of support personnel. For educators, counselors and administrators working in vocational settings with special needs students and students with disabilities.

L381—Introduction to Education of Behaviorally Disordered Students (3). Provides overview of field of education of emotionally disturbed children/youth through study of certain historical developments, concepts, problems, issues, definitions, nomenclature and behavioral characteristics basic to its understanding. Prerequisites: L311 or Educational and Counseling Psychology A205.

L382—Teaching the Behaviorally Disordered (3). Study of educational practices specific to teaching behaviorally disordered students. Consideration is given to the extension of information acquired in methods courses and alternatives in management of behavior. Prerequisite: instructor's consent.

L383—Introduction to Learning Disabilities (3). Overview of field of learning disabilities through study of certain historical developments, definitions, concepts, characteristics, and issues, basic to its understanding. Prerequisites: L311 and Educational and Counseling Psychology A205.

L384—Methods in Teaching the Learning Disabled (3). Emphasis on development of appropriate instructional plans for learning disabled students, curriculum development and goal setting, prescriptive and individualized instruction, and specialized techniques and methodologies of teaching.

L385—Introduction to Mental Retardation (3). Study of mental retardation including causal factors, learning characteristics, how people labeled mentally retarded have been treated. Emphasis on developing programs to assist retarded persons to participate fully in community. Prerequisite: L311 or Educational and Counseling Psychology A205.

L386—Teaching the Mentally Retarded (3). Study of learning characteristics, evaluation, teaching techniques, and methods and curriculum adaptations for mentally retarded. Prerequisite: L385.

L387—Introduction to Severely Handicapped (3). Study of historical events, legislation, casual factors, identification, and programs related to persons with severe handicaps. Emphasis on education and related services enabling these individuals to participate in integrated settings. Prerequisites: L339.

L388—Educational and Behavioral Intervention Procedures in Special Ed (2-3). Acquaints students with historical background, developments, concepts, definitions, terminology and techniques of educational and behavioral intervention, as well as practical application of these procedures. Prerequisite: Educational and Counseling Psychology A205.

L400—Problems in Special Education (1-99).

L401—Professional Seminar in Special Education (1). Designed to provide overview of Special Education, COE program requirements, and general graduate student expectations. Students STRONGLY encouraged to take course first semester in graduate program. Prerequisites: acceptance into a post- baccaluareate or master's degree program. Graded on S/U basis only.

L410—Seminar in Special Education (1-3).

L415—Practicum in Special Education Area of Handicapped (2-8). Provides graduate practicum experience relevant to the education of exceptional students. Prerequisites: L311 and instructor's consent.

L416—Practicum I: Cross-Categorical Special Education (3). Graduate field-based experience focused on observation and participation in programming for students with mild-moderate disabilities. Prerequisite: instructor and/or advisor's consent.

L417—Practicum II: Cross-Categorial Special Education (3-8). Advanced gradute field experience. Demonstration of required competencies with mild-moderate disabilities. Prerequisite: L416 and instructor and/or advisor's consent.

L420—Trends and Issues in Special Education (3). A study of the historical developments and related trends, issues and problems associated with the education of exceptional students. Prerequisites: admission to graduate study and instructor's consent.

L421—Research with Exceptional Children (3). Explores significant, historical, and current research in special education. Emphasizes the application of research, methodology, and findings relative to problems facing the practitioner. Prerequisites: admission to graduate study and instructor's consent.

L422—Grant Writing (3). Preparation of research, demonstration, training, or other grant proposals meeting the criteria for competitive funding by a federal agency; review and evaluation of proposals.

L423—Special Education Administration (3). Principles, protective safeguards, and general practices associated with the organization and administration of special education; legal foundations for special education; selection, training, and supervision of personnel.

L425—Foundations of Research in Special Education (3). Overview of professional writing and intermediate research applications with a focus on knowledge and skills needed for higher level doctoral work in statistics and research design. Prerequisites: A354 or equivalent, L421 or equivalent, and instructor's consent.

L426—Foundations I: History, Law and Policy in Special Education (3). The changing concept of disability will be viewed from the perspectives of history, legal issues, and policy traced from early Greek and European periods through contemporary times. Prerequisites: graduate standing and instructor's consent.

L427—Foundations II: Pedagogical Theories in Special Education (3). A study of theories of teaching as they apply to special education with emphases on empiricallly based practices, historical trends, current theories, and the relationship between theories of learning and teaching. Prerequisite: graduate standing and instructors consent.

L430—Nature and Needs of Gifted and Talented Students (3). A conceptual and empirical examination for educational personnel of student identification procedures, special populations, programming issues, research topics and teacher competencies. Prerequisite: instructor's consent.

L431—Curriculum Methods for Gifted and Talented Students (3). A theoretical examination for educational personnel of specific instructional approaches including structure of intellect, enrichment triad, empirical research, and creative problem solving. Prerequisites: L430 or instructor's consent.

L432—Planning and Administering Gifted Education Programs (3). Principles of program development for gifted and talented students. Topics include student identification, procedures, conducting needs assessments, teacher competencies, resource utilization, alternative administrative models, parent and community participation, program supervision and evaluation.

L433—Affective Development of Gifted Students (3). Psychosocial development of gifted students; theories, and practices in affective development; strategies to develop positive self-concept, successful coping strategies, and effective peer relationships by gifted students.

L434—Assessment and Evaluation in Gifted Education (3). Seminar focuses on practices for identifying students for gifted education programs, evaluation models applicable to school programs and strategies for grading and evaluation of gifted students.

L435—Practicum: Gifted Education (3). Provides graduate field experience in the area of gifted education. Prerequisite: instructor or advisor's consent.

L440—Psychological and Sociological Aspects of Mental Retardation (3). Study of psychological and sociological germane to the study of mental retardation including learning characteristics and mental retardation as a psychological phenomenon. Prerequisites: admission to graduate study and instructor's consent.

L445—Advanced Studies in Mental Retardation (3). Current theories and practices and their historic roots through examination of empirical and descriptive literature.

L446—Advanced Studies in Severe Disabilities (3). Theory, research and best practices; development, implementation and evaluation of programs leading to full inclusion of persons with severe disabilities.

L450—Programmatic Approaches to Educ. of Child. with Behav. Disorders (3). Course provides an in-depth study of the major theoretical perspectives and treatment programs for behavior disordered students. Prerequisites: admission to graduate study and instructor's consent.

L455—Advanced Studies in Behavioral Disorders (3). Contemporary issues a historical perspective; theoretical perspectives or models which guide research, policy, and intervention approaches.

L460—Assessment and Remediation of Learning Disabilities (3). Provides further study of the methods, materials, and current research on psychoeducational assessment and program planning for the disabled learner. Prerequisites: L383 or instructor's consent.

L462—Special Education Literacy Assessment and Instruction (3). Study of literacy assessment and instruction methods specific to special education; formal and informal assessment: language and instructional strategies to improve literacy for students with disabilities. Pre/co-requisites: L312, L323, L331, L324, Literacy Methods.

L465—Advanced Studies in Learning Disabilities (3). Major current issues, trends, and controversies in learning disabilities; theories, research, and practices in learning disabilities.

L470—Introduction to Early Childhood Special Education (3). An overview of theoretical perspectives, issues underlying education of young handicapped children (birth to five years). Rationale, scope, theoretical foundations for early intervention and legislative issues. Prerequisite: L311.

L471—Assessment in Early Childhood Special Education (3). Procedures and instruments used in assessment of children with special needs, including screening, diagnosis, interpretation of diagnostic findings, and application to instructional plans.

L472—Method of Early Childhood Special Education (3). Instructional programming, management, and evaluation relative to the provision of intervention of children with disabilities.

L474—Practicum: Early Childhood Special Education (3). Graduate field experience in an approved setting for young children with special needs. May be repeated. Prerequisite: instructor's consent.

L475—Advanced Studies in Early Childhood Special Education (3). Origins, theoretical perspectives, issues, scope and efficacy of the field of early childhood special education.

L480—Internship: College Teaching in Special Education (3). Individually guided and supervised college teaching experiences. Competency based activiities using portfolio assessment methods. May be taken more than once. Prerequisite: instructor's consent.

L481—Internship: Special Education Research (1-99). Individually guided research internship with doctoral advisor and/or faculty mentor(s). Opportunity to develop research

competencies either on individual or collaborative projects. May be taken more than once. Prerequisite: instructor's consent.

L482—Internship: Professional Practice in Special Education (1-99). Individually guided internship in the public schools and/or agencies serving students with special needs or exceptionalities. Focus on professional practices, administrative practices, and/or evaluation practices.

L483—Introduction to Cross-Categorical Special Education (3). Study of characteristics of mild-moderate disabling conditions and associated issues such as assessment, programming options, and inclusionary practices. Pre/co-requisites: L312, L323, L324, L331, and L416.

L484—Cross-Categorical Teaching Methods (4). Will provide the learner with current empirically validated best practices for use with children and youth with mild disabilities. Both academic and social behavior instructional methodology will be reviewed. Prerequisites: Introduction to Cross Categorical.

L490—Research in Special Education (1-99). Graded on a S/U basis only.

Statistics

College of Arts and Science
222 Mathematical Sciences Building
(573) 882-6376

FACULTY

Farroll T. Wright, chair, professor, PhD, University of Missouri-Columbia.

Richard W. Madsen, associate chair, professor, PhD, Iowa State University.

Joseph E. Cavanaugh, director of graduate studies, director of graduate admissions, assistant professor, PhD, University of California-Davis.

John E. Hewett, director of undergraduate studies, professor, PhD, University of Iowa.

Asit P. Basu, professor, PhD, University of Minnesota.

Chong Zhuoqiong He, assistant professor, PhD, Purdue University.

Gary F. Krause, professor, PhD, Virginia Polytechnic Institute.

Paul L. Speckman, professor, PhD, University of California-Los Angeles.

Dongchu Sun, associate professor, PhD, Purdue University.

Jianguo Sun, assistant professor, PhD, University of Waterloo, Canada.

Yazhen Wang, associate professor, PhD, University of California-Berkeley.

Christopher K. Wikle, assistant professor, PhD, Iowa State University.

Matthew Wood, lower division coordinator, PhD, University of California-Davis.

DEGREES: MA and PhD in statistics

The graduate program provides opportunities for study in various areas of probability and statistics, both theoretical and applied. The Statistical Consulting Center in the Mathematical Sciences Building provides opportunities for statistical consulting and assists faculty and graduate students in cooperative research with people in other areas. Regular statistics colloquia provide opportunities for faculty, graduate students and outside visitors to present the results of their research.

The Department of Statistics maintains a state-of-the-art UNIX computer network with approximately 15 Sun workstations. Students have access to the network through PCs in student offices and through the Statistics Department computer laboratory, a fully equipped facility with workstations, X-terminals, PCs and a video projector for teaching. An extensive library of software including S-PLUS, SAS, and common programming languages is maintained. Students also have access to the campus RS/6000 computing network and a campus SGI supercomputer.

The Mathematical Sciences Building houses the departments of mathematics and statistics, and the mathematical sciences library. The library has an outstanding collection of books and journals concerning mathematics and statistics.

Fellowships and teaching and research assistantships are available to qualified graduate students.

For further information, write the Director of Graduate Admissions in Statistics, 222 Mathematical Sciences Building, Columbia, MO 65211.

Admission is open to any student who holds a baccalaureate degree from an accredited college and whose record indicates the likelihood of successfully completing a graduate program in statistics. This usually implies an undergraduate major in an area that requires successful completion of the undergraduate calculus sequence. Undergraduate courses in statistics are recommended but not required. Consideration also is given to rank in graduating class, trends in grade records, maturity and experience, and other criteria bearing on qualifications. Ordinarily students should have at least a 3.0 GPA (A=4.0) in mathematics and statistics courses to enter the master's degree program, and at least a 3.5 GPA in mathematics and statistics to become PhD candidates. The Department of Statistics requires the GRE general test.

Before entering the graduate program, a student should have a background that includes matrix theory and calculus and some exposure to statistics. Some required courses at the 300 level not taken as an undergraduate may be taken for graduate credit as part of the graduate program.

MASTER'S DEGREE: The general requirements for receiving a master's degree are at least 30 semester hours of course work at the 300 level or higher, of which at least 18 hours must be from the Department of Statistics at MU. The 30 hours may not include credit hours of 302, 315, 320, 385, 395, or more than a total of six hours of 400 or 490.

At least 15 semester hours of course work at the 400 level must be taken from the Department of Statistics at MU. Credit will be given for only two of Statistics 423, 463, 464. The 15 semester hours cannot include more than a total of three hours of 400 or 490.

The following courses are required if equivalent courses were not taken as an undergraduate; Mathematics 302 or 310, 331, Statistics 325 and 326. These courses may not be used for more than six of the required 30 hours. All candidates must submit a written report demonstrating an independent effort toward producing original work. This report may, with the adviser's consent, take the form of a thesis, a written review on a set of papers in statistics, or a written report on some independent study that may include an original application of statistics. For this work a student must register for at least three semester hours of 400 or 490.

All candidates are required to present an open seminar on the results of the written report. The report should be made available for public review, through the Department of Statistics office, for at least one week before the examination. The MA examination will consist of an examination of the material presented in the written report and the seminar, and may also cover course work.

Additional courses recommended but not required are 305, 416, 463, 464 and 465; Mathematics 311; Computer Engineering and Computer Science 103 or 203.

Any student, while a graduate student in this program, who receives a grade of C or lower in six or more hours of courses offered by the Department of Statistics, or, a grade of C or lower in nine or more hours of all courses taken, will be dismissed from the graduate program unless contrary action is taken by the graduate faculty of the department. For each credit hour with a grade of C or lower, except for three credit hours, received in courses offered by the Department of Statistics at the 300 level and above, the student must receive a credit hour with a grade of A in courses offered by the department at the 300 level and above.

MASTER'S MINOR: To receive a designated minor in statistics for a master's degree, at least 12 credit hours of course work at the 300 level or higher must be completed from the Department of Statistics at MU. The courses should be unified in theme, and must be approved by the Director of Graduate Studies in the Department of Statistics. The courses must be completed with an average grade of B (3.0) or higher; shall not include Statistics 300, 301, 302, 400, or 490; and shall not include more than one course from Statistics 315, 320 and 325.

DOCTORAL DEGREE: To enter the PhD program in statistics a student must pass the qualifying examination. The examination, which is offered at the beginning of each fall semester, is based on Statistics 325 and Statistics 326. A student may not take the qualifying examination more than twice without approval of the graduate faculty of the department. Until it is passed, a student who plans to pursue a PhD in this department must take the qualifying examination each fall semester after completing two semesters, not counting summer semesters, in this graduate program unless permission to not take the examination is granted by the graduate faculty of the department. The examination will be prepared and evaluated by the graduate faculty. A committee of graduate faculty members appointed by the director of graduate studies will conduct the examination, have it graded and make recommendations to the graduate faculty.

Within one semester of passing the qualifying examination, students ask their advisers to recommend a doctoral program committee, which will consist of a minimum of five members, at least three of which are members of the doctoral faculty in statistics and at least one from another MU doctoral program.

Students must pass the qualifying examina-

tion and have a doctoral program committee prior to taking the preliminary examination, which will be taken usually at the beginning of the third year. The examination will be based on 400-level statistics courses. Students taking the examination must have taken at least six 400-level courses (other than Statistics 400, 490 and 416) — either at MU or at comparable institutions. There will be two parts. The first paper will be based on Statistics 403, 463 and 464. The second paper will be based on three other 400-level courses, not including STAT 423 or the six courses listed above, chosen by the student in consultation with the doctoral program committee. A student may not take the preliminary examination more than twice without approval of the graduate faculty of the department. The examination will be departmental. A committee of graduate faculty members appointed by the director of graduate studies will conduct the examination, have it graded and make recommendations to the graduate faculty.

Students must pass the preliminary examination before taking the comprehensive examination. The doctoral program committee will plan and conduct the comprehensive examination. It consists of both written and oral sections.

A dissertation, prepared under the direction of a dissertation supervisor, is required. The dissertation should be presented in an open seminar as part of the final examination, which will be conducted by the final examination committee. The dissertation should be made available for public review, through the Department of Statistics office, for at least one week before the examination.

Additional requirements for the PhD in statistics are determined by the student's program committee and the director of graduate studies.

COURSES

207—Statistical Analysis (3). For graduate students and superior seniors with no previous training in statistics. Intensive study of concepts, techniques of statistical analysis, and their applications. Prerequisite: Mathematics 10 or equivalent. f,w,s.

215—Elements of Probability and Statistics (3). Primarily for middle and secondary mathematics education students. Probability, random variables, expectations, descriptive statistics, estimation, hypothesis testing, and regression. Introduction to materials for middle and secondary school use. Prerequisites: Math 61 or 80 or equivalent.

250—Introduction to Probability and Statistics II (3). Continuation of 150. Estimation; hypothesis testing; regression; correlation; statistical decision theory; Bayesian inference. Computer is used to assist in learning concepts. Prerequisite: grade in the C range or better in Statistics 150. f,w,s.

292—Statistical Methods in the Health Sciences (3). Basic inference methods, both parametric and non-parametric, appropriate for answering questions arising in health sciences research. Computer exercises involving data from real experiments from health science area. Prerequisite: Mathematics 10 and graduate standing or instructor's consent.

295—Introduction to Statistical Models for Research (3). Models and methods commonly used in research, including simple and multiple regression, one and two-way ANOVA, non-parametric methods, loglinear and logistic regression models. Grade in the C range or better in Statistics 25, 31, 185, 207, or 292 or instructor's consent. Credit will not be given in both Statistics 250 and 295.

298—Honors (2). Special work for Honors candidates in statistics.

299—Honors (2). Special work for Honors candidates in statistics.

300—Problems (1-3). Independent investigations. Reports on approved topics. Prerequisite: instructor's consent. f,w,s.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent. Prerequisites: junior standing and instructor's consent.

302—Senior Seminar (3). A capstone course required of and open only to senior statistics majors. Students will participate in statistical consulting, attend colloquia, and review articles in professional journals. Writing of reports will be emphasized. Prerequisite: senior statistics major.

305—Statistical Software and Data Analysis (3). Programming with major statistical packages emphasizing data management techniques and statistical analysis for regression, analysis of variance, categorical data, descriptive statistics, non-parametric analyses, and other selected topics. Prerequisite: any 200 or above course in the Statistics department or instructor's consent.

307—Nonparametric Statistical Methods (3). Statistical methods when the functional form of the population is unknown. Applications emphasized. Comparisons with parametric procedures. Goodness of-fit, chi-square, comparison of several populations, measures of correlation. Prerequisite: 207 or 215 or 250 or 295 or 320 or equivalent.

320—Introduction to Mathematical Statistics (3). (same as Mathematics 320). Introduction to theory of probability and statistics using concepts and methods of calculus. Prerequisites: Mathematics 201 or instructor's consent. No credit for both 315 and 320. f,w,s.

321—Statistical Computing and Simulation (3). Computing known statistical formulae using statistical software. Graphs in three dimensions. Computing new formulae and simulating operating characteristics using higher languages. No credit for students who have completed 304. Prerequisite: 320 or equivalent, or instructor's consent. f.

325—Introduction to Probability Theory (3). (same as Mathematics 325). Probability spaces; random variables and their distributions; repeated trials; probability limit theorems. Prerequisites: Mathematics 201 or instructor's consent. f,w.

326—Statistical Inference (3). (same as Mathematics 326). Sampling; point estimation; sampling distribution; tests of hypotheses; regression and linear hypotheses. Prerequisite: 325. w.

327—Theory of Nonparametric Statistics I (3). A first course in Non-parametric statistical methods based on ranks. Both theory and application are emphasized. Two-sample problems. K-sample problems. Tests for independence. Contingency tables. Goodness-of-fit tests. Prerequisite: 320 or instructor's consent.

328—Introduction to Stochastic Processes (3). Study of random processes selected from: Markov chains, birth and death processes, random walks, Poisson processes, renewal theory, Brownian motion, Gaussian processes, white noise, spectral analysis, applications such as queuing theory, sequential tests. Prerequisite: 325.

345—Categorical Data Analysis (3). Discrete distributions, frequency data, multinomial data, chi-square and likelihood ratio tests, logistic regression, log linear models, rates, relative risks, random effects, case studies. Prerequisites: Statistics 326, or both 385 and 395.

360—Deming Philosophy & Statistical Process Control (3). Statistical control charts, economic design of control charts, acceptance sampling, pareto chart, and other graphical procedures, Deming philosophy, Taguchi methods. Prerequisites: Statistics 320 or 326 or instructors consent.

370—Sampling Techniques (3). Theory of probability sampling designs. Unrestricted random sampling. Stratified sampling. Cluster sampling. Multistage or subsampling. Ratio estimates. Regression estimates. Double sampling. Prerequisites: 207 or 215 or 250 or 295 or 320 or 326.

375—Operations Research (3). Study of mathematical and statistical models employed in operations research. Prerequisites: 207 or 215 or 250 or 320 or 326. f.

385—Regression and Correlation Analysis (3). Measurement of relationships among variables including multiple regression, partial correlation, and some nonparametric methods. Prerequisites: 207 or 215 or 250 or 295 or 320 or 326 & Mathematics 80. f,w.

386—Applied Time Series Analysis (3). (same as Management and Marketing 386). A study of univariate and multivariate time series models and techniques for their analyses. Emphasis is on methodology rather than theory. Examples are drawn from a variety of areas including business, economics and soil science. Prerequisites: Statistics 326, or both Statistics 320 and 395 or instructor's consent.

395—Analysis of Variance (3). Study of analysis of variance and related modeling techniques for cases with fixed, random, and mixed effects. Exposure to designs other than completely randomized designs including factorial arrangements, repeated measures, nested, and unequal sample size designs. Prerequisite: Statistics 207 or 215 or 250 or 295 or 320 or 326. f,w,s.

400—Problems and Special Readings (1-99). Approved reading and study, independent investigations, and reports on approved topics. Prerequisites: graduate standing and instructor's consent. f,w,s.

403—Mathematical Statistics I (3). Multivariate distribution. Multivariate normal. Non-central chi-square and F distributions. Asymptotic distributions of maximum likelihood estimators, goodness-of-fit statistics and likelihood ratio test statistics. Information and locally best test. Prerequisites: 326, Math 310 or Math 331 or instructor's consent.

404—Mathematical Statistics II (3). Theory of both estimation and test of hypotheses including sufficiency, completeness and exponential families. Neyman-Pearson lemma, uniformly most powerful tests, similarity and invariance. Minimax, Bayes and uniformly minimum variance unbiased estimates. Confidence intervals and ellipsoids. Prerequisites: 403 or instructor's consent.

411—Statistics Seminar (1-99).

416—Statistical Consulting (3). Participation in statistical consulting under faculty supervision. Formulation of statistical problems. Planning of surveys and experiments. Statistical computing. Data analysis. Interpretation of results in statistical practice. Prerequisites: 326; 464 or 385 & 395; instructor's consent.

420—Bayesian Statistics (3). Bayes theorem, subjective probability, likelihood principle, non-informative priors, conjugate priors, asymptotic properties, Bayesian computation, hierarchical Bayes, statistical decision, Bayesian hypothesis testing, predictive inference, applications. Prerequisite: Statistics 326, Math 331 and Math 302 or equivalent.

423—Experimental Design (3). Examination and analysis of modern statistical techniques applicable to experimentation in social, physical or biological sciences. Prerequisites: 395 or instructor's consent.

430—Reliablity Theory & Survival Analysis (3). Statistical failure models. Parametric life test procedures. Non-parametric life test procedures. Bayes methods. System Reliability. Accelerated life testing. Kaplan-Meier estimator. Cox's regression model. Prerequisites: 403 or instructor's consent.

440—Advanced Probability (3). (same as Mathematics 440). Measure theoretic probability theory. Characteristic functions; conditional probability and expectation; sums of independent random variables including strong law of large numbers and central limit problem. Prerequisites: 325, Math 310; or instructor's consent.

441—Stochastic Processes (3). (same as Mathematics

441). Markov processes, martingales, orthogonal sequences, processes with independent and orthogonal increments, stationarity, linear prediction. Prerequisite: 440.

452—Special Topics in Statistics (1-99). Prerequisite: instructor's consent.

461—Recent Developments in Statistics (3). The content of the course which varies from semester to semester, will be the study of some statistical theories or methodologies which are currently under development, such as bootstrapping, missing data, non-parametric regression, statistical computing, etc. Prerequisites: 326 and instructor's consent.

463—Linear Models I (3). Theory and application of multiple regression analysis (Matrix representation of linear model, curve fitting, model building, subset selection, residual analysis, regression diagnostic, ridge and nonlinear regression) Prerequisite: 320 or 326, Math 331 and instructor's consent.

464—Linear Models II (3). Theory and application of analysis of variance (crossed classification, blocking, contrast and multiple comparisons, repeated measures, random effects and mixed models, analysis of covariance, introduction to designed experiments). Prerequisite: 463.

465—Advanced Linear Models (3). Advanced topics in the theory and application of linear models. Specific content varies with instructor. Prerequisites: 464, Math 302 and 310 or instructor's consent.

466—Multivariate Analysis (3). Distribution of sample correlation coefficients. Derivation of generalized T-squared and Wishart distributions. Distribution of certain characteristic roots, vectors. Test of hypotheses about covariance matrices and mean vectors. Discriminant analysis. Prerequisites: 326, Math 302, 331 or instructor's consent.

470—Theory of Nonparametric Statistics II (3). Estimation, hypothesis testing, confidence intervals, etc., when functional form of the population distribution is unknown. Prerequisites: 403 or 327 or instructor's consent.

490—Research (1-99). Graded on a S/U basis only.

Textile and Apparel Management

College of Human Environmental Sciences
137 Stanley Hall (573) 882-7317

FACULTY

Kitty Dickerson, chair, professor, PhD, St. Louis University. Textile and apparel industries; international trade in textiles and apparel; textile trade policy.

Usha Chowdhary, associate professor, PhD, The Ohio State University. Functional and sociopsychological aspects of clothing and textiles.

Betty Dillard, associate professor, PhD, University of Missouri-Columbia. Apparel manufacturing and management issues: worker health and safety, material utilization, factory outlets.

Jean Hamilton, associate professor, PhD, University of Missouri-Columbia. Cultural analysis of appearance and appearance-related economic and social institutions; qualitative social research methods.

Pamela Norum, associate professor, PhD, Cornell University. Consumer purchasing and consumption behavior; retailing.

Laurel Wilson, associate professor, PhD, University of North Carolina-Greensboro. History of textile and apparel production and trade in America.

Susan Henson, instructor, MS, Virginia Polytechnical Institute and State University. Marketing; product development; technical assistance; human resources; and training.

DEGREES: MA and MS in textile and apparel management; and PhD in human environmental sciences with an emphasis area in textile and apparel management

Graduate programs in textile and apparel management offer the following areas of study: apparel manufacturing management; apparel marketing and merchandising; economic/trade issues related to domestic and global textile and apparel industry; historical and contextual aspects of production, distribution and consumption of textile and apparel products; social issues related to dress/clothing, including sociopsychological, cultural and consumer marketplace concerns.

Career opportunities for graduates exist in many areas, such as higher education, industry analysis, museums, product development, production management and cooperative extension.

See **Human Environmental Sciences** for general information.

For additional information write the Director of Graduate Studies in Textile and Apparel Management, 137 Stanley, Columbia, MO 65211.

COURSES

280—Textile Analysis (3). Importance of textile analysis in quality control; determination of textile performance and serviceability; and comparative examination of textiles with varying chemical, physical, andweave structures. Prerequisite: 180, one course in Physics or Chemistry suggested . w.

281—Patternmaking (3). (same as Theatre 255). A beginning course in the methods of pattern drafting. Methods explored include: flat patterning, draping, and theatrical patterning techniques. Prerequisite: 180 or Theatre 21 and instructor's consent. Graded on A/F basis only. w, even yrs.

282—Principles of Apparel Manufacturing (3). A study of the apparel manufacturing industry including the decision making involved in marketing, merchandising, and producing apparel. Prerequisites: 180, 181. f.

283—Textiles and Apparel in the Global Economy (3). Economic, social, and political dimensions of the textile complex and trade in a global economy; implications for production, distribution, and consumption of products. Prerequisite: 5-6 hours of Economics, (TAM majors should have TAM 184).

285—The Clothing/Textiles Consumer (3). Examines the effects of economic, social and marketing factors on the clothing consumption process. Legislative and quality issues related to clothing and textiles are also discussed. Prerequisites: 3 credits of merchandising, marketing or microeconomics; three credits in computer science and three credits in statistics.

286—Retail Finance and Merchandise Control (3). Emphasizes assortment and financial planning utilizing computer applications in the retail environment. Prerequisites: TAM 186 and a three credit computer course.

288—Social Psychology of Clothing (3). Clothing and appearances as reflection and function of social psychological theories perspectives. Prerequisite: two courses in sociology, psychology, or economics, and 188. w.

290—Professional Seminar (1). Exploration of issues in professional activity/success including: evaluating opportunities, oral and written communication for presenting oneself, the articulation of professional/private life, and professional ethics. Prerequisites: Second semester junior, first semester senior. or prior to internship.

300—Problems (1-99). Prerequisites: junior standing and instructor's consent.

318—Topics (1-99). Selected current topics in field of interest.

345—History of Textile Manufacturing and Trade (3). Focuses on changing issues affecting the textile and apparel industry today and examines those issues from both historic and current perspectives. Prerequisite: TAM 187, 188 or instructor's consent.

350—Readings (1-99). Prerequisites: senior standing and instructor's consent.

355—Recent Trends (1-3). For upper-class and graduate students who wish additional knowledge and understanding in specific subject matter areas.

381—Apparel Manufacturing and Merchandising (3). Investigation of the complex interaction of manufacturing, marketing, and merchandising in the apparel industry, achieved through instructional and experiential study. 180 or 282. Letter grading only. f.

382—Apparel Production Management (3). Examination of issues and management strategies necessary to produce a competitively priced apparel product of high quality. Prerequisites: 282 and junior standing or above. Letter grading only. w.

383—Computer Aided Patternmaking (3). (same as Theatre 355). Use of computer aided design technology to perform pattermaking techniques for apparel production. Prerequisite: 281 or Theatre 255, and basic computer course or instructor's consent. Graded on A/F basis only. w, odd yrs.

384—Strategic Analysis of the Textile, Apparel and Retail Industries (3). This course will integrate facets of each student's area of concentration with important concepts from related disciplines. Prerequisites: enrollment during the student's last 45 hours of coursework; 15 hours of TAM coursework completed.

385—Textile Fibers (3). Advanced study of textile fibers; emphasis on their structure, composition, physical and chemical properties. Prerequisites: 182 and 6 hours Organic Chemistry.

386—Retail Marketing and Merchandising (3). Analytical management techniques appropriate for evaluation of retailing productivity. Emphasis on the use of these techniques and others in the development of a comprehensive retail marketing strategy. Prerequisites: 186, Accountancy 36, Marketing 204.

387—19th and 20th Century Western Dress (3). A study of nineteenth and twentieth century Western dress as influenced by time, place, and culture. Prerequisites: 187, or Theater 20 or instructor's consent.

388—Clothing, Behavior, and Society (3). Utilization of contextual perspective to examine and to understand us of clothing as a tool in symbolic interaction. Prerequisite: 188 or instructor's consent.

389—Clothing for Individuals with Special Needs (3). An integration of scientific, functional, and aesthetic princples, theories, and techniques to design, select and adapt clothes for those with special needs. Prerequisites: 181 or 182 or instructor's consent.

390—Field Training (1-99). Practical aspects of internship experience coordinated with the university curriculum. Available for various areas of emphasis. Prerequisites: 2.5 GPA, instructor's consent, and necessary prerequisites for area of emphasis. See department for internship guidelines.

400—Problems (1-99). Prerequisites: 300-level course in field of problem and instructor's consent.

410—Seminar (1-4). Reports and discussion of recent work in area of concentration.

412—Qualitative Social Research Methods (3). Focus is on the philosophical differences inherent in an interpretivist versus a positivist approach to social research, the strategies and methods of qualitative research, and qualitative research design and criticism. Prerequisite: graduate standing. May be repeated twice.

415—Readings (1-99). Readings in recent research material in textiles and/or clothing. Prerequisites: graduate stand-

ing, 20 hours Textile and Apparel Management, and instructor's consent.

418—Topics (1-99). Selected current topics in field of interest.

430—Survey of Research in Textile and Apparel Management (3). A survey of current research in textiles and apparel management. Underlying theory, research design and empirical techniques will be analyzed and critiqued. Prerequisites: graduate standing, 3 hours in Statistics and 3 hours in Research Methods.

450—Research (1-99). Independent research not leading to a thesis. Report required.

480—Textile Fabrics (3). Advanced study of textile fabrics with emphasis on dyeing, finishing, and physical testing. Prerequisites: 182 & senior or graduate standing.

483—Advanced Textiles and Apparel in the Global Economy (3). Advanced analysis of economic aspects of the domestic and international textile and apparel industries. Prerequisites: 184, Economics 51 or equivalent, graduate standing.

484—International Trade in Textiles and Apparel (3). Economic, social, and political aspects of international production and trade of textiles and apparel. Prerequisites: Economics 326 and Tam 283 or 483, or instructor's consent.

487—Textile History Seminar (3). Investigation of research in textile and costume history with emphasis on developing questions, methods of analysis and interpretation appropriate for data sources used. Prererequisite: 345, 382, or 387 or instructor's consent.

488—Cultural Analyses of Dress (3). Examines the social context of dress and other intimate manifestations of daily life using culture as the level of analysis. Prerequisites: 388, graduate standing, or instructor's consent.

490—Research (1-99). Independent research leading to thesis or dissertation. Graded on a S/U basis only.

Theatre

College of Arts and Science
129 Fine Arts Center (573) 882-2021

FACULTY

Weldon B. Durham, chair and director of graduate studies, professor, PhD, University of Iowa.
Stephen M. Archer, professor emeritus, PhD, University of Illinois.
Patrick Atkinson, professor, MFA, Illinois State University.
Suzanne Burgoyne, professor, PhD, University of Michigan.
Larry D. Clark, professor emeritus, PhD, University of Illinois.
James Miller, professor, MFA, Southern Mississippi University.
Clyde Ruffin, professor, MFA, University of Iowa.
Carla Waal, professor emerita, PhD, University of Indiana.
Richard Klepac, associate professor, PhD, University of Missouri-Columbia (on leave).
David Crespy, assistant professor, PhD, City University of New York.
Anne Fliotsos, visiting assistant professor, PhD, University of Maryland-College Park.
Dean Packard, technical director/adjunct assistant professor, MFA, University of Iowa.
Kerri Packard, costume director/adjunct assistant professor, MFA, University of Iowa.

DEGREES: MA and PhD in theatre

The Department of Theatre stresses the history, theory, criticism and practice of the art of the theatre. Master's and doctoral programs are designed to develop the individual student as an artist scholar.

MASTER'S DEGREE: Applicants must present an undergraduate GPA of at least 3.0 (A=4.0) for the last 60 hours of undergraduate work, GRE general test scores and at least three letters of recommendation.

The master of arts degree may be completed under either a thesis option, approved by an advisory committee, or a non-thesis option. Both plans require a minimum of 30 hours of graduate credit, including at least 15 hours of course work at the 400 level. There is no language requirement.

DOCTORAL DEGREE: Applicants must present a GPA of at least 3.0 for the last 60 hours of the undergraduate degree, GRE general test scores, three letters of recommendation, a statement of purpose, and a scholarly writing sample.

Accepted candidates must take qualifying examinations during the first semester of registration. Those with a master's degree from MU may be excused from this examination.

Doctoral degree requirements include the successful completion of:

- A course of study, including a doctoral minor, designed in consultation with the student's doctoral program committee
- Research tool/foreign language requirement
- Written and oral comprehensive examination
- A dissertation accepted by the student's program committee
- An oral defense of the dissertation

FOREIGN LANGUAGE REQUIREMENT: For information on the foreign language requirement, see the Department of Theatre Graduate Handbook.

For additional information write the Director of Graduate Studies in Theatre, 129 Fine Arts Center, Columbia, MO 65211.

COURSES

201—Topics (1-99). Organized study of selected topics. Subject and credit may vary from semester to semester. May be repeated with department consent. Prerequisite: instructor's consent.

211—Intermediate Playwriting (3). (same as English 211). Intermediate study of the writing process as applied to theatre, leading to the creation of a full-length play to be considered for production. Prerequisite: 111.

220—Technical Theatre Practicum (1). Credit earned in a technical project in support of a University Theatre production. May be repeated to total of three hours. Prerequisite: 20. Graded on a S/U basis only.

233—Oral Interpretation of Literature (3). Analysis, oral reading of prose, poetry, drama. Planned to meet needs of prospective teachers of English or speech or those interested in advanced performance training.

240—Vocal Performance Technique (3). This course develops the ability to use the voice as a creative and expressive instrument through a comprehensive study of speech and voice dynamics which include the exploration of proper breathing, relaxation, tonal placement, and non-regional articulation.

243—Acting I (3). Basic theory, practice of acting, stage movement.

244—Acting II (3). Script analysis, character and role development in modern and contemporary non-realist theatrical forms. Rehearsal and presentation of scenes, based on contemporary dramatic and performance theory. Prerequisite: Theatre 60.

251—Theatrical Costume Design (3). Basic practice in costume rendering using charcoal, crayon, ink, watercolor and other media. Costume history, both theatrical and general, will be surveyed. Basic problems of theatre design will be considered. Prerequisite: 20.

253—Scene Painting (2). Studio practice in techniques of painting scenery for the Theatre. Prerequisite: 20.

255—Beginning Patternmaking (3). (same as Textiles and Apparel Management 281). A beginning course in the methods of pattern drafting. Methods explored include: flat patterning, draping, and theatrical patterning techniques. Prerequisite: Theatre 21 and instructor's consent. Graded on A/F basis only. w, even yrs.

256—Sound Design (3). Beginning sound design for the theatre. Units include basics of researching, recording, and augmenting sound for the use in a theatrical production. Prerequisite: 20 and instructor's consent.

261—Theatrical Directing (3). Theory and practice of play directing, script selection, casting, play analysis, rehearsal and performance. Prerequisite: 60 and instructor's consent.

265—American Musicals (3). (same as Music-General 265). Historical survey of the development of the 20th-Century American Musical in Theatre and Film.

266—Musical Theatre Performance (3). (same as Music 266). A practical study for the actor of theatrical songs through character analysis, lyric interpretation and movement. A performance course. Prerequisite: instructor's consent.

267—Studies in Theatre History and Drama (3). Physical theatre, theatre organization, performance crafts, drama, and performance/dramatic theory of selected period(s). Prerequisite: Theatre 60, 66. May be repeated to a maximum of 6 hours with instructor's consent.

280—Internship (1-3). Internship: Experimental learning as an actor, designer, technician, publicist/manager, or dramaturge with an approved theatre company. Prerequisites: junior/senior standing and departmental consent. S/U graded only.

301—Topics (1-99). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent. Prerequisites: junior standing and instructor's consent.

311—Advanced Playwriting: Problems (3). (same as English 311). Advanced study of the writing process as applied to theatre, including theory and practice. Special playwriting problems and techniques. Prerequisite: 211.

320—Senior Project (1). Credit earned for advanced juried projects in acting, directing, design, and stage management. Prerequisite: instructor's consent. Graded on a S/U basis only.

340—Summer Repertory Theatre (1-99). Seminar, participation, laboratory in Summer Repertory Theatre. May be repeated. Prerequisite: instructor's consent.

343—Studies in Dramatic Theory (3). Analysis of history, meaning and function of selected concepts of contemporary dramatic and performance theory. Prerequisite: senior standing.

344—Studies in Dramatic Criticism (3). Survey of methods of criticism of scripts and performances. Prerequisite: senior standing.

347—Acting III (3). Period acting sytles. Special projects in interpretation, rehearsal, creation of roles. Prerequisites: Theatre 60 and 243 or 244.

350—Directed Reading Theatre (1-3). Independent reading, reports. Prerequisite: instructor's consent.

351—Theatre Organization and Management (3). Practical and theoretical procedures of various types of theatre organizations. Areas covered will include stage management, shop management, crew management, and the orga-

nizational structure of various types of theatrical organizations.

352—Scene Design (3). Theory and practice of scenic design for the theatre with emphasis on the evolutionary process of design from concept to reality. Prerequisite: 154 or instructor's consent.

354—Stage Lighting Design (3). Theory and practice of lighting for theatre production. Prerequisite: instructor's consent.

355—Advanced Patternmaking (3). (same as Textiles and Apparel Management 383). Use of computer aided design technology to perform patternmaking techniques for apparel production. Prerequisite: Theatre 255, and basic computer course or instructor's consent. Graded on A/F basis only. w, odd yrs.

362—Advanced Directing (3). Advanced principles of theatrical directing; emphasizes stylistic variations. May be repeated once. Prerequisite: 261 and instructor's consent.

363—Studies in Dramatic Literature (3). Advanced survey of major movements, periods, writers. Prerequisite: senior standing. Repeatable to a maximum of 6 hours with instructor's consent.

364—Development of Dramatic Art II (3). Study of major dramas from 1875 to present. Prerequisite: Theatre 60.

365—Theatre Architecture (3). Examines the renovation of existing buildings into workable theatre spaces. Includes history of theatre architecture. Prerequisite: 6 hours upper-level Theatre courses.

367—Studies in Theatre History (3). Advanced survey of major periods, movements. Prerequisite: senior standing. Repeatable to a maximum of 6 hours with instructor's consent.

368—Theatre History II (3). Major dramatic movements from Restoration to present. Prerequisites: junior standing or instructor's consent.

399—Theatre Capstone (2). Theatre experiences and knowledge gained by students are connected through compilation of resume and portfolio. Student will meet with faculty jury to discuss his/her body of theatrical work. Required for senior theatre students. Prerequisite: instructor's consent.

400—Problems (1-99). Individual study or project not leading to thesis or dissertation. Prerequisite: instructor's consent.

401—Topics (1-99). Organized study of selected topics. Topic and credit may vary semester to semester. May be repeated with department consent. Prerequisite: instructor's consent.

441—Introduction to Theatre Scholarship (3). History, aims and techniques of academic writing in Theatre, including research, types of studies, primary materials, interpretation, writing techniques, and publication. Prerequisite: graduate standing.

450—Research (1-99.9). Independent research of advanced nature leading to report. Prerequisite: instructor's consent.

451—History of American Theatre I (3). Examination of theatrical literature and production from the beginnings to World War One. Prerequisites: graduate standing and instructor's permission.

452—History of the American Theatre II (3). Examination of theatrical literature and production from World War One to the present. Prerequisite: graduate standing and instructor's permission.

460—Seminar in Theatre History (3). Selected problems in theatre history. May be repeated.

462—Backgrounds of Modern Theatre Practice (3). Survey of modern performance theory, aesthetics and practice. Emphasis on European theatre since 1875. May be repeated.

466—Seminar in Dramatic Theory and Criticism (3). Selected topics in dramatic theory and criticism. May be repeated.

490—Research Theatre (1-99). Research leading to thesis or dissertation. Prerequisite: instructor's consent. Graded on a S/U basis only.

College of Veterinary Medicine

Dean's Office
W-203 Veterinary Medicine Bldg. (573) 882-2655
FAX [573] 884=5044

Please consult the University of Missouri-Columbia web site at http://www.missouri.edu for current course and program information.

DEGREES: MS in biomedical sciences; PhD in pathobiology area program; PhD in physiology area program

MASTER OF BIOMEDICAL SCIENCES

Graduate education and research are integral parts of veterinary medicine. Research programs in veterinary medicine are needed to provide a better understanding of normal and disease states and methods of prevention of diseases of animals and humans. Such efforts contribute to the advancement of biomedical science and significantly enhance animal and human health.

The College of Veterinary Medicine offers graduate study leading to the Master of Biomedical Sciences degree in the following areas of specialization: **veterinary biomedical sciences, veterinary clinical sciences, veterinary pathobiology,** and **laboratory animal medicine.** Individual program descriptions are on the following pages.

If students elect two areas of specialization, they must enroll in appropriate courses to assure competence in both areas.

The candidate must have completed a baccalaureate, DVM or MD degree. Completion of the DVM degree is a prerequisite for admission to the MS degree program in the areas: laboratory animal medicine (LAM), and veterinary clinical sciences. These programs include residency training and are designed to prepare trainees for board certification and are the basis for a career in teaching, research and/or public or private practice.

The MU Graduate School requires that the Graduate Record Examination (GRE) be taken prior to application. Minimum GRE scores for Parts I (Verbal), II (Quantitative), and III (Analytical) are established by the faculty of the area. MU Graduate School acceptance is required of all applicants.

The application must include a complete curriculum vitae, a statement of professional and academic goals, three letters of reference and copies of all university transcripts. The director of graduate studies (DGS) of each area will evaluate the adequacy of academic records and will act on admission. Each applicant must have a major adviser or faculty sponsor who is a member of the emphasis area prior to acceptance. All qualified applicants may not be permitted to pursue studies because of limitation in facilities and research funding.

■ MASTER'S DEGREE AREAS OF SPECIALIZATION

Veterinary Biomedical Sciences

E-102 Veterinary Medicine Building
(573) 882-7011

FACULTY

M. Harold Laughlin, chair, professor, PhD, University of Iowa.
Ronald L. Terjung, associate chair, professor, PhD, University of Iowa.
Gheorghe M. Constantinescu, professor, DVM, PhD, University of Bucharest.
V.K. Ganjam, professor, DVM, SV University-India, PhD, Oklahoma State University.
Robert C. McClure, professor, DVM, Iowa State University, PhD, Cornell University.
John F. Amann, associate professor, DVM, PhD, Cornell University.
Lane L. Clarke, associate professor, DVM, University of Missouri-Columbia, PhD, North Carolina State University.
Elise P. Gomez-Sanchez, adjunct associate professor, DVM, PhD, Texas A&M University.
Calvin C. Hale, associate professor, PhD, University of Texas-Austin.
Eileen M. Hasser, associate professor, PhD, University of Oklahoma.
Meredith Hay, associate professor, PhD, University of Texas Health Science Center at San Antonio.
Cheryl M. Heesch, associate professor, PhD, University of Texas Health Science Center at San Antonio.
Gary S. Johnson, associate professor, DVM, University of Minnesota, PhD, Kansas State University.
Elmer M. Price, associate professor, PhD, University of Cincinnati.
Chada S. Reddy, associate professor, DVM, Andhra Pradesh Agricultural University, PhD, University of Mississippi.
George E. Rottinghaus, associate professor, PhD, Iowa State University.
Leona J. Rubin, associate professor, PhD, University of Colorado.
James C. Schadt, associate professor, PhD, Texas Tech University.
Richard Tsika, associate professor, PhD.
Wade V. Welshons, associate professor, PhD, Harvard University.
Steve (Hsiao-Tung) Yang, research associate professor, PhD, Brigham Young University.
Trenton Boyd, AHIP, adjunct assistant professor, MA, University of Missouri-Columbia.
John R. Dodam, assistant professor, DVM, The Ohio State University, PhD, North Carolina State University.
Brian L. Frappier, clinical assistant professor, DVM, Michigan State University, PhD, The Ohio State University.
Collette Wagner-Mann, adjunct assistant professor, DVM, University of Missouri-Columbia, PhD, Texas A&M University.

The program in **Veterinary Biomedical Sciences** provides in-depth, multidisciplinary training to prepare scientists in comprehensive, interdisciplinary research (molecular, cellular, organ and integrative). Individuals who successfully complete this program will have

diverse backgrounds in state-of-the-art research methodologies and approaches that will make them well-rounded, competitive scientists. Departmental faculty represent a diversity of medical and related basic science disciplines. They provide a rich environment for graduate study and a unique opportunity for training scientists in comprehensive interdisciplinary research.

The curriculum and training challenges instill in the student the capacity for critical thinking and scientific inquiry. The course curriculum centers on the strategy of developing in the student a multidisciplinary understanding to biomedical research. Core courses include physiology, cell biology, and the multidisciplinary approaches to biomedical research. Students also take a minimum of one additional course in each of the areas of molecular biology, cellular biology and integrative biology.

DEGREE REQUIREMENTS: In general, the successful applicant will possess a baccalaureate degree with a GPA of 3.0 or above (A=4.0). The applicant should have completed undergraduate course work in organic and inorganic chemistry, physics, calculus, and general biological sciences courses to include the following college semester hours or their equivalents: biology, 10; chemistry (basic and inorganic), 10; and one course each in biochemistry, physics and calculus. The applicant should have demonstrated an aptitude and express a desire to train toward a career in research and/or academic biological science. The successful applicant will be expected to score 1500 or higher on the GRE (sum of three tests; verbal, quantitative and analytical). Students may strengthen their application by taking the appropriate advanced portion of the GRE.

Minimum course requirements for the master of science degree at MU are 30 hours of graduate credit. In addition to the departmental core courses, students take courses specifically planned to meet the needs and strengths of the individual. The student also must carry out an original research project, write a thesis, and defend it in an oral examination.

AREAS OF STUDY: Anatomy, biology of membrane transport mechanisms, cardiovascular physiology and pharmacology, endocrinology, molecular biology, neurohumoral regulation, pharmacology, physiology, reproductive biology, reproductive-endocrinology, toxicology.

COURSES

200—Problems (1-99.9). Assignment of problems for training in research.

219—Elements of Veterinary Anatomy (3). For agriculture and other students desiring basic knowledge of anatomical terminology and the comparative functional anatomy (developmental, microscopic and gross) of domestic animals. Prerequisites: 5 hours Biological Sciences (Zoology) or equivalent.

222—Fundamentals of Animal Physiology (3). For students not enrolled in the professional veterinary medicine curriculum. Relationship of structure and function in the common domestic animals. Study of intercellular material, cells, tissues, organs and systems.

300—Problems (1-99.9). Assignment of special problems or topics for training in research.

302—Cytology, Histology, and Organology of Domestic Animals I (3). Detailed study of the structure and function of the cell, basic tissues (epithelium, connective tissue, muscle, nervous tissue) and several organ systems (cardiovascular, lymphatic, integument, digestive, visual, auditory) of domestic mammals and birds. Prerequisites: graduate standing, background in biological sciences, instructor's consent. f.

303—Cytology, Histology and Organology of Domestic Animals II (2). Detailed study of the liver, gallbladder, and pancreas, urinary system, respiratory system, endocrine glands, female reproductive system, placenta, male reproductive system, and integument (hoof and claw) of domestic mammals and birds. Prerequisites: 302 and instructor's consent. w.

307—Embryology and Development of Domestic Animals (2). Developmental anatomy of domestic animals. Special written report and/or review required. Prerequisites: background in Biological Science and departmental consent.

311—Canine Dissection (6). Study of gross anatomy of the dog by lecture, dissection, discussion. Special written report and/or review required. Prerequisites: background in Biological Science & departmental consent.

312—Anatomy of Common Domestic Animals (5). Gross anatomy of horse, ox, sheep, pig, cat, chicken; particular attention to areas of veterinary medical importance. Special written report and/or review required. Prerequisites: 311 or equivalent, Biological Science background and departmental consent.

326—Veterinary Pharmacology (3). General principles of pharmacodynamics in domesticated animals.

327—Principles of Physiologic Adaptation (3). Physiologic mechanisms in individual mammals in coping with acute and chronic alterations in physical environment. Pressure, temperature, gravity and radiation considered. Prerequisites: Vertebrate Physiology or Physiological Zoology, 4 credits; Chemistry, 5 credits; or instructor's consent.

328—Principles of Toxicology (3). Essentials of toxicology and survey of major toxicant groups, including poisonous plants, and the industrial and agricultural chemicals. Prerequisites: Biochemistry or instructor's consent.

333—Veterinary Cell Biology (4). Course material stresses cell biology as related to animal health and medical issues. Prerequisite: Biochemistry or permission of course director.

400—Problems (1-99.9). Selected problems and/or topics for advanced study in special areas to meet needs of individual students.

401—Comparative Anatomy of Cardiovascular System (1).

405—Membrane Structure and Function (3). The structure and function of biological membranes is examined from a biochemical perspective. Topics include membrane proteins, transport, membrane biogenesis, and analytical techniques. Prerequisites: Biochemistry 272 (or equivalent) or instructor's consent. w, alt years.

409—Advanced Microscopic Anatomy (1-99.9). Advanced microscopic study of selected topics in vertebrate microscopic anatomy. Special report required. Prerequisites: 303 or equivalent, graduate standing, instructor's consent.

410—Seminar (1). Presentation and discussion of investigations and topics in veterinary anatomy-physiology or related fields, by qualified students, instructors, and guests. Prerequisite: departmental consent.

421—Veterinary Physiology (5). (same as 505A and 505B). Continuation of 420. Digestion, excretion, endocrinology, reproduction.

425—Microvascular Circulatory Function (3). (same as Physiology 435). An in-depth study of microcirculatory structure and function in various tissues with emphasis on recent developments in the understanding of the mechanisms involved in nutrient supply, edema formation, lymphatic function and fluid balance. Prerequisite: Veterinary Physiology 220V and 221V or 305 Mammalian Physiology or equivalent. w, even years.

427—Fate of Drugs in the Animal Body (2). (same as Pharmacology 427). Principles concerned with absorption, distribution, excretion, and biotransformation of drugs. Prerequisites: 10 hours Physiology, 5 hours Pharmacology and 5 hours Biochemistry. alt. w, odd years.

434—Gonadal Function (3). (same as Animal Science 434). Prerequisites: Animal Science 304 or equivalent, a course in endocrinology, and biochemistry or cell biology

450—Research (1-99.9). Open to graduate students with requisite preparation. Research not expected to terminate in thesis.

490—Research (1-99.9). Open to graduate students with requisite preparation. Research expected to be presented as a thesis. Graded on a S/U basis only.

Veterinary Clinical Sciences

A-383 Veterinary Medical Teaching Hospital
(573) 882-7821

FACULTY

Cecil P. Moore, acting chair, professor, diplomate ACVO, DVM, University of Missouri-Columbia, MS, University of Wisconsin.

Robert S. Youngquist, associate chair, professor, diplomate ACT, DVM, Iowa State University.

David A. Wilson, acting associate chair, associate professor, diplomate ACVS, DVM, MS, University of Illinois.

Joe N. Kornegay, dean, professor, investigator, Dalton Cardiovascular Research Center, diplomate ACVIM (neurology), DVM, Texas A&M University, MS, PhD, University of Georgia.

C.B. Chastain, professor, associate dean for academic affairs, diplomate ACVIM, DVM, University of Missouri-Columbia, MS, Iowa State University.

Everett Aronson, associate professor, director, student and alumni affairs, diplomate ACVR, DVM, University of Illinois.

John D. Bonagura, Gilbreath-McLorn Endowed Professor in Cardiology, director of graduate studies; diplomate ACVIM, (cardiology) DVM, MS, The Ohio State University.

V.K. Ganjam, professor, DVM, SV University, MS, Washington State University, PhD, Oklahoma State University.

Allen W. Hahn, professor, co-director, Medical Informatic Training, investigator, Dalton Cardiovascular Research Center, diplomate ACVIM, (cardiology) DVM, University of Missouri-Columbia, PhD, Drexel Institute of Technology.

Ross P. Cowart, associate professor, diplomate ABVP, DVM, University of Georgia, MS, University of Illinois.

David K. Hardin, clinical associate professor, director, Veterinary Medical Extension and Continuing Education, diplomate ACT, DVM, University of Missouri-Columbia.

Philip J. Johnson, associate professor, diplomate ACVIM, BVSc, University of Bristol, MS, University of Illinois.

Brent D. Jones, associate professor, DVM, Colorado State University.

Kevin Keegan, associate professor, diplomate ACVS, DVM, University of Missouri-Columbia, MS, University of Illinois.

Jimmy C. Lattimer, associate professor, diplomate ACVR, DVM, Washington State University, MS, Colorado State University.

Fred Anthony Mann, associate professor, diplomate ACVS, DVM, The Ohio State University, MS, Texas A&M University.
Dudly McCaw, associate professor, diplomate ACVIM, DVM, University of Illinois.
Nat T. Messer IV, associate professor, diplomate ABVP, DVM, Colorado State University.
Robert B. Miller, associate professor, diplomate ABVP, DVM, Kansas State University, MS, PhD, University of Missouri.
Dennis O'Brien, associate professor, diplomate ACVIM (neurology), DVM, MS, PhD, University of Illinois.
Eric R. Pope, associate professor, diplomate ACVS, DVM, MS, Auburn University.
James Tomlinson, associate professor, diplomate ACVS, DVM, University of Minnesota, MVSc, University of Saskatchewan.
Jeff Tyler, associate professor, diplomate ACVIM, DVM, University of Minnesota, MPVM, PhD, University of California-Davis.
Leah A. Cohn, assistant professor, diplomate ACVIM, DVM, University of Tennessee, PhD, North Carolina State University.
John R. Dodam, assistant professor, diplomate ACVA, DVM, The Ohio State university, MS, PhD, North Carolina State University.
Carolyn J. Henry, assistant professor, diplomate ACVIM (oncology) DVM, MS, Washington State University.
Jeffrey Lakritz, assistant professor, diplomate ACVIM, DVM, PhD, University of California.
Robert Larson, clinical assistant professor of veterinary medical extension, diplomate ACT, DVM, PhD, University of Kansas.
Germain Nappert, assistant professor, diplomate ACVIM, DMV, MSc, Universtiy of Montreal, MVSc, PhD, University of Saskatchewan.
Richard F. Randle, veterinary extension ruminant health specialist, DVM, Mississippi State University, MS, University of Illinois.

The Department of Veterinary Medicine and Surgery offers graduate work leading to the master of science degree in veterinary biomedical sciences with an emphasis in clinical sciences, as well as supervision for postdoctoral study and research. The program provides advanced training in equine, food and companion animal medicine and surgery, and comparative cardiology, neurology, ophthalmology, radiation biology, radiology and theriogenology. Graduate students have ready access to clinical patients, medical records and facilities of the Veterinary Medical Teaching Hospital to aid them in clinical research. The college has its own library.

DEGREE REQUIREMENTS: The DVM degree or its equivalent, as approved by the Departmental Research and Graduate Studies Committee, is a prerequisite for advanced study. Applicants must have ranked in the upper half of their respective graduating class. It may be possible, in special circumstances, to accept graduate students interested in only post-DVM graduate studies. The prospective student should request that prior GRE scores be sent, if previously taken. The GRE requirement may be waived for exceptional students by the Departmental Research and Graduate Studies Committee. Applicants may be asked to strengthen any deficiencies in prerequisites to the chosen area of concentration through enrollment in the University Post-Baccalaureate Special Student Program.

Planning a program of study is the joint responsibility of the student, the adviser, and the student's advisory committee. An advisory committee of at least three faculty members should be chosen during the first semester of enrollment. The advisory committee offers guidance and is responsible for approving a definitive program of study. The advisory group should consist of the major adviser and appropriate faculty members from the department, and at least one other member from another department within the college or university. Members of this committee may be recommended later for appointment to the examining committee. Members of the final examination committee should be chosen in the same manner as the advisory committee. A thesis reporting the results of original research is required of all candidates. A scientific paper based on the thesis research must be submitted to a referred journal.

AREAS OF STUDY: anesthesiology, comparative cardiology, medicine, neurology, oncology, ophthalmology, radiology, surgery and theriogenology.

COURSES

Courses taught at the 200- and 300-level are available to graduate students and to professional students with third or fourth year standing and permission of the instructor; the prerequisite for courses at the 400-level is the DVM (or equivalent professional) degree. Most 400-level courses taught in the department are scheduled over a three-year cycle to insure coordination and availability to graduate students enrolled in the combined residency-MS program. Students should contact the Director of the Research and Graduate Studies Committee, Veterinary Medicine and Surgery, regarding specific course scheduling.

300—Problems (1-99.9). Studies in specific areas of veterinary medicine and surgery.
301—Advanced Topics in Emergency and Critical Care (1-99.9). In-depth discussions will be conducted to sharpen the student's cognitive skills in emergency and critical care topics. Outside readings will be assigned prior to discussion periods. Special emphasis will be placed on topics which are superficially covered or omitted from standard veterinary professional student curricula and topics for which information rapidly changes based on ongoing research. Some example topics include blood gases, cardiopulmonary/cerebral resuscitation, shock, disseminated intravascular coagulation, cerebral trauma, and oxygen administration techniques. Prerequisites: DVM degree.
302—Topics (1-99.9). Organized study of select topics. Prerequisites: junior standing and instructor's consent.
303—Advanced Topics in Veterinary Anesthesia (1). (same as Vet Med & Surgery 699D).
304—Advanced Equine Surgery (2). Advanced Equine Surgery will be a lecture and laboratory course for residents of Equine Surgery in the Department of Veterinary Medicine and Surgery. The purpose of the course is to aid in the preparation of the resident for Board certification in the American College of Veterinary Surgeons. Prerequisites include a DVM or equivalent degree, acceptance to the graduate school, acceptance to the residency program, and instructor approval. Each participant will be awarded a letter grade (A, B, C or F) based on their participation and the results of oral examination. Course may be repeated for credit.
321—Expert Systems (3). (same as Computer Science, Sociology and Anthropology 321). Introduction to the use of expert systems, designed for graduate students from any department. Students create prototype expert systems under close supervision by faculty experts. Prerequisite: departmental consent.
328—Introductory Radiation Biology (3). (same as Radiology 328 and Nuclear Engineering 328, and Biological Sciences 328).
351—Advanced Surgical Techniques (1-99.9). Special application to large, small animals. Prerequisite: D.V.M.
355—Advanced Techniques in Radiology (1-99.9). Special application to domestic animals. Prerequisite: D.V.M.
400—Problems in Veterinary Clinical Sciences (1-99.9). Supervised individuals studies arranged with a faculty member and approved by the advisory committee
401—Topics in Veterinary Clinical Sciences (1-3). Current topics, infrequently-taught courses, or new courses not yet designated by a permanent course number.
402—Seminar in Veterinary Clinical Sciences (1). Graduate seminars and conferences with a focus on current literature within a specialty area. Graded on S/U basis only.
402A—Seminar in Veterinary Medicine and Surgery - Neurology Seminar (1). Weekly journal review and seminar on current topics in veterinary neurology, related clinical disciplines and basic neurosciences. Prerequisites: DVM degree. f,w,s. Graded on A-F basis only.
402B—Internal Medicine Cliniopathologic Conference (1). Graded on S/U basis only.
402C—Internal Medicine Journal Review (1). Graded on S/U basis only.
402D—Medicine-Surgery-Pathology Conference (1). Graded on S/U basis only.
402E—Equine Medicine Journal Review (1). Graded on S/U basis only.
402F—Surgery Journal Review (1). Graded on S/U basis only.
402G—Food Animal Medicine Journal Review (1). Graded on S/U basis only.
402H—Cardiovacular Medicine Journal Review (1). Graded on S/U basis only.
402I—Emergency and Critical Care Journal Review (1). This course will concentrate on review of emergency and critical care literature. Prerequisite: DVM degree. Graded on S/U basis only.
405—Comparative Respiratory Pathophysiology (1). A consideration of clinical pathophysiology of the respiratory system relative to diseases of the thorax and clinical anethesiology.
410—Veterinary Medicine and Surgery Research Semiar (1). Current research in veterinary medicine and surgery. Literature reviews and presentation or original graduate student research.
411—Clinical Veterinary Endocrinology (2). Clinical Veterinary Endocrinology will be a 2-hour coruse for post-DMV graduate students. It will focus on clinically relevant physiology, pathophysiology, and diagnostic evaluation of hormone systems.
413—Equine Internal Medicine (2). Prerequisite: DVM degree or equivalent.
415—Advanced Veterinary Internal Medicine - Neurology (2). Basic neuroscience as it relates to clinical neurology and the pathophysiology of diseases of the brain, spinal cord, peripheral nerve and muscle in domestic animals. Prerequisites: DVM degree. A/F grading only.
416—Advanced Veterinary Internal Medicine: Cardiovasular Medicine (3). Pathologic, pathophysiologic, hemodynamic and pharmacologic mechnisms of important to the diagnosis, assessment, management and research of

cardiovasular diseases of animals.

418—Advanced Veterinary Internal Medicine: Food Animal Medicine (2). Current concepts in the pathophysiology, diagnosis and management of medical disorders, diseases of the limbs, and infectious diseases of cattle and food producing animals.

421—Advanced Veterinary Surgery: Small Animal Surgery (2-4). Current concepts in the pathophysiology, diagnosis and management of surgical disease of the dog and the cat. Includes laboratories of advanced surgical techniques.

425—Advanced Veterinary Surgery: Equine Surgery (2-4). Current concepts in the pathophysiology, diagnosis and management of surgical disorders of the horse. Taught yearly as sections A, B, C. Repeatable to a maximum of 10 credit hours (individual sections may be taken once).

430—Medical Informatics (3). (same as Health Services Management 430). Examines clinical research and administrative application of the computer in health services delivery. Provides an introduction to medical informatics. Prerequisite: appropriate class in computer methods/application or instructor's consent.

431—Research Methods and Data Analyses (2-4). A consideration of research methods, data analysis, and practical approaches to analyzing data sets derived from veterinary and biomedical studies.

435—Veterinary Clinical Sciences: Clinical Immunology (2). Advanced concepts in veterinary immunology and immunopathology.

436—Veterinary Clinical Sciences: Clinical Pharmacology (1). Advanced concepts in veterinary clinical pharmacology, pharmacokinetics, and anesthesiology.

437—Advanced Topics in Veterinary Medicine & Surgery-Nuclear Medicine (1). This course will proved an in-depth review of veterinary nuclear medicine. This will include the physics of nuclear medicine, common imaging techniques, common radiopharmaceuticals, radiophamaceutical kinetic evaluation and some common physiological applications. Pertitnet reading material will include review articles and original works that describe nuclear medicine techniques routinely used in veterinary medicine.

439—Advanced Vterinary Ultrasonography (2-3). Advanced concepts in veterinary ultrasonography; including ultrasound and Doppler physics, instrumentation, examination methodology, and interpretation of studies.

445—Veterinary Critical Care and Emergency Medicine (2-3). Advanced study of veterinary critical care and emergency medicine and surgery focusing on current research and literature as well as clinical application.

450—Research (1-99.9). Open to graduate students with requisite preparation.

487—Nuclear Medicine (3). Degrees equivalent to D.V.M. acceptable. Principles of radiation detection instrumentation, monitoring radiological safety and diagnostic procedures used on veterinary nuclear medicine. Prerequisites: one year College Physics, D.V.M. degree, and departmental consent.

488—Radiation Therapy (3). Radiobiological basis for radiation therapy, principles of dosimetry, and radiological safety and treatment. Designed for conditions common in veterinary medicine. Prerequisites: one year College Physics, D.V.M. degree, & departmental consent.

490—Research (1-99.9). Open to graduate students with requisite preparation. Graded on a S/U basis only.

Veterinary Pathobiology

201 Connaway Hall (573) 882-6550

FACULTY

Gerald M. Buening, interim chair, professor and associate dean for research and postdoctoral studies, DVM, PhD, Purdue University.

John N. Berg, professor, DVM, Iowa State University, MS, PhD, University of Missouri-Columbia.

C. Andrew Carson, professor, VMD, University of Pennsylvania, PhD, University of Illinois.

Robert M. Corwin, professor, DVM, Michigan State University, PhD, University of Georgia.

William H. Fales, professor, PhD, University of Idaho.

Harvey Gosser, professor, director, veterinary medical diagnostic laboratory, DVM, Auburn University, PhD, University of Missouri-Columbia.

Ronald M. McLaughlin, professor, director, office of laboratory animal medicine, DVM, MS, Iowa State University.

Lela K. Riley, professor, PhD, University of Kansas.

Joseph E. Wagner, curators' professor, DVM, Iowa State University, MPH, Tulane University, PhD, University of Illinois.

Alex J. Bermudez, associate professor, DVM, MS, University of Illinois.

Cynthia Besch-Williford, associate professor, DVM, Louisiana State University, PhD, University of Missouri-Columbia.

Stan W. Casteel, associate professor, DVM, University of Missouri-Columbia, PhD, Texas A&M University.

D. Mark Estes, associate professor, PhD, Texas A&M University.

Craig L. Franklin, associate professor, DVM, PhD, University of Missouri-Columbia.

Theodore J. Green, associate professor, PhD, The Ohio State University.

Reuel R. Hook, Jr., associate professor, PhD, West Virginia University.

Gary S. Johnson, associate professor, DVM, University of Minnesota, PhD, Kansas State University.

Gayle C. Johnson, associate professor, DVM, University of California-Davis, PhD, Washington State University.

John M. Kreeger, associate professor, DVM, PhD, Louisiana State University.

Margaret A. Miller, associate professor, DVM, University of Missouri-Columbia, PhD, Washington State University.

Lanny W. Pace, associate professor, DVM, Mississippi State University, PhD, Louisiana State University.

Bimal K. Ray, associate professor, PhD, Calcutta University.

Heide Schatten, associate professor, director, Electron Microscopy Core Facility, PhD, University of Heidelberg, Germany.

Steven L. Stockham, associate professor, DVM, Kansas State University, MS, Michigan State University.

Larry P. Thornburg, associate professor, DVM, Texas A&M University, PhD, University of North Carolina.

James G. Thorne, associate professor, DVM, University of Missouri-Columbia, PhD, MPVM, University of Georgia.

James R. Turk, associate professor, DVM, University of Missouri-Columbia, PhD, Washington State University.

Gary K. Allen, assistant professor, DVM, Mississippi State University, PhD, University of Missouri-Columbia.

Barry C. Holwerda, assistant professor, PhD, University of Saskatchewan.

Robert S. Livingston, clinical assistant professor, DVM, University of Illinois, PhD, University of Missouri-Columbia.

Antoinette Marsh, research assistant professor, PhD, University of California-Davis.

William Jefferson Mitchell, Jr., assistant professor, DVM, Auburn University, PhD, Cornell University.

Michael Scott, assistant professor, DVM, University of Minnesota, PhD, Michigan State University.

Earl K. Steffen, research assistant professor, PhD, University of Missouri-Columbia.

Advanced study in the Department of Veterinary Pathobiology is offered via graduate programs leading to master of science and doctoral degrees, through specialized residencies, and through postdoctoral research appointments. Faculty from the College of Veterinary Medicine, School of Medicine, College of Arts and Science, and College of Agriculture, Food and Natural Resources cooperate jointly for graduate study. These programs provide in-depth training to prepare students for careers in teaching, research, diagnostic and government services in veterinary microbiology, immunology, parasitology, toxicology, infectious and parasitic diseases, inheritable disease of domestic animals, public health, and other biomedical areas. Training opportunities are varied and depend upon the focus and career goals of the student.

DEGREE REQUIREMENTS: The College Veterinary Medicine offers a MS degree in Biomedical Sciences with specialization in Veterinary Pathobiology or Laboratory Animal Medicine. The MS degree is administered through the Department. In addition, the Department of Veterinary Pathobiology offers residency programs in Pathology and Laboratory Animal Medicine that may be pursued concurrently with either the MS or PhD degrees. Breadth of training is facilitated by collaboration with colleagues at the Veterinary Medical Teaching Hospital, the Research Animal Diagnostic and Investigative Laboratory, the Veterinary Medical Diagnostic Laboratory, and with fellow scientists in agriculture, biology, and medicine.

The MS degree requires 30 credit hours of work including courses, seminars, research, and problems courses. The program includes research in a particular field and defense of a thesis that embodies the results of this work. Certain areas of emphasis require submission of a formal master's thesis while others require preparation of a publishable manuscript.

AREAS OF STUDY: anatomic pathology, clinical pathology, epidemiology, immunology, microbiology, molecular biology, molecular genetics, parasitology, pathobiology and toxicology

COURSES

200—Problems (1-99.9). Assignment of special topics for research training in veterinary pathobiology.

210—Parasitology (4). Parasitism is considered as a fundamental type of interspecies interaction. Principles of parasitism as that apply to animals are presented with emphasis on parasitic morphology, biology and host-parasite relationships. Prerequisites: 8 hrs of biology. w, even years.

230—Animal Sanitation and Disease Prevention (3). Preventative measures for diseases and parasites of farm animals. Prerequisites: Veterinary Anatomy-Physiology 219 or Veterinary Anatomy-Physiology 222.

248—Veterinary Meat Hygiene, Zoonosis, and Preventive Medicine (2).

300—Problems (1-99.9). Prerequisites: D.V.M. and depart-

mental consent.

345—Veterinary and Human Parasitology (4). Protozoa and helminths of veterinary and human importance; 3 one-hour lectures, 1 two-hour lab per week. Advanced undergraduate or graduate standing in biological, veterinary or medical sciences. Prerequisites: Biological Sciences 210 or equivalent and instructor's consent. w, even years.

347—Clinical Epidemiology and Environmental Health (1-10). Ecologic basis of health and disease and cause-effect relationships. Evaluation of control programs. Includes epidemiology of important acute and chronic animal diseases. Prerequisite: enrollment in a professional medical, dental or public health curriculum.

410—Seminar (1). Discussion of current research methods in veterinary pathobiology and AFTP case studies.

411—Seminar in Histopathology (1). Discussion of current research and/or case studies in pathology of diseases of domestic animals, laboratory animals and avian species. Team taught. f,w.

421—Advanced Epidemiology (3). (same as Family & Community Medicine 421). w., even years.

430—Comparative Pathology (3). (same as Pathology and Anatomical 430) Biochemical and morphologic lesions related to the mechanism of disease expression in plants and animals.

431—Advanced Veterinary Pathology (3-5). Specific assignments on diagnostic methods including surgical pathology, necropsies, toxicology. Prerequisite: departmental consent.

432—Advanced Histopathology (5). Advanced microscopic study of pathological tissues. Prerequisite: departmental consent.

433—Veterinary Oncology (2). History and molecular biology of neoplasia; laboratory for discussion of practical aspects of diagnosis. Prerequisites: graduate standing and instructor's consent.

434—Advanced Clinical Pathology (4). Lecture/tutorial teaching: pathogenesis of clinical abnormalities with emphasis on abnormal clinical laboratory test results. Lab: recognition and pathogenesis of abnormalities found via microscopic or other clinical laboratorial analaysis. Prerequisite: departmental consent.

436—Pathogenic Mechanisms in Veterinary Pathobiology (3). This course will include disease mechanisms, described at the cellular and molecular level, which result in tissue morphologic (gross and microscopic) and clinical abnormalities. Examples of discussion topics include soluble mediators of inflammatory processes, host-agent interactions, and host defense mechanisms. Graded A,B,C,F,I. Prerequisite: DVM degree, instructor's consent. w, even yrs.

437—Pathology of Laboratory Animals (4). (same as Laboratory Animal Medicine Area 437). Gross and microscopic study of spontaneous and naturally occurring diseases in laboratory animals. Prerequisite: departmental consent. alt. w, even years.

438—Primatology (3). Disease and pathology of primates. Prerequisite: departmental consent.

442—Advanced Veterinary Pathogenic Bacteriology (3). Study of pathogenic bacteria causing animal disease. Pathogenic mechanisms and host-parasite relationships are emphasized. Laboratory procedures for isolation and identification of pathogens are included. Prerequisites: graduate standing and instructor's consent. alt. f, odd years.

443—Viral Infection and Immunity (3). Study of virus infection at the level of the intact animal. Includes immunology of domestic animal species. Prerequisites: graduate standing and instructor's consent. alt. w, even years.

445—Advanced Veterinary Parasitology (3). Parasitic diseases of domestic and exotic animals and those of public health significance. Prerequisites: one course in general parasitology and graduate standing. alt. w, odd years.

446—Advanced Immuniology and Immunopathology (3). Study of the immune system at the level of the intact animal. Includes a discussion of immunity-infectious diseases. Prerequisites: Microbiology 304 (Immunology), graduate standing and instructor's consent. alt. f, even years.

447—Oncogenic Animal Viruses (3). Biology of RNA-and DNA-containing animal tumor viruses and their in vitro and in vivo interactions with host cells. Prerequisites: 343 or Microbiology 405, or equivalent, General Biochemistry or instructor's consent. alt. f, even years.

448—Molecular Methods in Nucleic Acids (3). The course will focus on the most recent developments in technology related to eukaryotic and prokaryotic molecular biology and as analysis a manipulation of nucleic acids and their application to define structure, function and biosynthesis of macromolecules. Prerequisites: instructor's consent.

450—Non-Thesis Research (1-99.9). Research not expected to terminate in dissertation.

451—Electron Microscopy (1). (same as Plant Pathology 451). w.

452—Cell and Molecular Electron Microscopy (4). (same as Plant Pathology 452). Prerequsites: 451.

453—Scanning Electron Microscopy Laboratory (3). (same as Plant Pathology 453). Prerequisites: 452.

468—Laboratory Animal Biology (4). (same as Labortory Animal Sciences 468). Taxonomy, anatomy, physiology, nutrition and behavior of laboratory animals including nonhuman primates and less common species are covered. Genetics, gnostobiology, housing and production are also presented. Prerequisite: instructor's consent.

471—Decision Support System (3). (same as Health Services Management)

490—Thesis Research (1-99.9). Open to graduate students with requisite preparation. Research on specific animal diseases, prevention and treatment. Graded on a S/U basis only.

552—Veterinary Bacteriology I (2.5). Classification and properties of pathogenic bacteria and fungi of animals; relationship to public health; considers pathogenesis, immunology of infection. Prerequisite: enrollment in the College of Veterinary Medicine. Instructional period 5.

553—Veterinary Bacteriology II (3). Continuation of 242AV. Prerequisite: same as 242AV. Instructional period 6.

556—Veterinary Parasitology I (2.5). Parasites and parasitic diseases of ruminants, horses, swine, dogs, cats, poultry and other animals. Includes classification, morphology, and bionomics of protozoa, helminths, and arthropods. Prerequisite: enrollment in the College of Veterinary Medicine. Instructional period 5.

557—Veterinary Parasitology II (3). Continuation of 245AV. Prerequisite: same as 245AV. Instructional period 6.

Laboratory Animal Medicine

209 Connaway Hall (573) 882-6628
http://www.missouri.edu/~gradron/lamap/

FACULTY

Craig L. Franklin, director of graduate studies, associate professor of veterinary pathobiology, DVM, PhD, University of Missouri-Columbia.

Ronald McLaughlin, professor of veterinary pathobiology, director, Office of Laboratory Animal Medicine, DVM, MS, Iowa State University.

Joseph E. Wagner, Curators' Professor of veterinary pathobiology, DVM, Iowa State University, MPH, Tulane University, PhD, University of Illinois.

Lela K. Riley, professor of veterinary pathobiology, PhD, University of Kansas.

Cynthia L. Besch-Williford, associate professor of veterinary pathobiology, DVM, Louisiana State University, PhD, University of Missouri-Columbia.

Reuel R. Hook Jr., associate professor of pathobiology, PhD, University of West Virginia.

Robert S. Livingston, clinical assistant professor of veterinary pathobiology, DVM, University of Illinois, PhD, University of Missouri-Columbia.

Earl K. Steffen, research assistant professor of veterinary pathobiology, PhD, University of Missouri-Columbia.

This postdoctoral (post-DVM) program meets the training requirements for eligibility for the American College of Laboratory Animal Medicine (ACLAM) certification examination and prepares graduates for research and service careers in the specialty of laboratory animal medicine.

Acceptance for advisement requires a DVM or equivalent from an accredited college of veterinary medicine or successful completion of the foreign equivalency examination and approval by the Laboratory Animal Medicine Area Program (LAMAP) faculty. In addition, applicants must meet standards for admission to the Graduate School.

DEGREE REQUIREMENTS: The LAMAP emphasizes comparative medicine research training and includes graduate course work and residency rotations. In the first year of training, each postdoctoral fellow spends six months in each of the following rotations: diagnostic laboratory animal pathology and microbiology in the Research Animal Diagnostic and Investigative Laboratory (RADIL); clinical medicine and animal resource management in the Office of Laboratory Animal Medicine (OLAM). The remaining two to three years of the training time are spent with roughly 80 percent devoted to research training under an established investigator and 20 percent in residency in the RADIL or OLAM. Throughout the program, fellows participate in laboratory animal teaching and instructional programs offered to veterinary students and research personnel.

The MS degree requires the completion of a significant manuscript suitable for publication in a refereed journal, or an approved equivalent scholarly effort. Requirements for elective course work, residency and teaching experience are determined with the student's advisory committee.

Typically there are 10-12 postdoctoral fellows in the program at once. Networking and sharing of experiences and cooperation among fellows is an important factor in the success of the program.

The program offers considerable exposure to administration and operation of laboratory animal resource units under the direction of ACLAM diplomats. This, besides a solid didactic program and research experience, prepares graduates for a variety of laboratory animal positions in academia and industry. Trainees desiring to change to a PhD program have the opportunities to do so in a variety of programs including pathobiology and physiology. Requirements for these programs can be found in the **Doctoral Programs** section of the College of Veterinary Medicine degree offerings beginning on this page.

Two-year non-degree training programs emphasizing either comparative medicine or clinical laboratory animal medicine, laboratory animal pathology and animal resource management

can be arranged for qualified individuals with advanced degrees or experience in laboratory animal medicine.

PROGRAMMATIC STRENGTHS:

- The opportunity for comparative studies in a joint veterinary medical and human medical environment
- The multidisciplinary nature of the faculty participating in the training program
- The emphasis on facility management and diagnostic pathology, training toward board certification and research
- The opportunity for combined residency and graduate study
- Active AAALAC accredited research animal facilities and a full-service research animal diagnostic laboratory
- A long history of successful training in laboratory animal medicine, and a substantial number of board-certified faculty in laboratory animal medicine

Trainees completing the first year of training may compete for financial support by stipends from an institutional NIH Training Grant (National Research Service Award). Trainees are encouraged to apply for individual NIH postdoctoral fellowships. Diagnostic laboratory funds also are available.

Required graduate courses include pathology of laboratory animals, methodology of animal experimentation, biology of laboratory animals, laboratory animal resource management, statistics and seminars. Elective courses frequently taken by trainees include immunology, biochemistry, mechanisms of disease, molecular biology, and virology. Research typically deals with the application of an animal model in the investigation of human diseases or the study of naturally occurring diseases of laboratory animals.

To apply for the program, students should contact Dr. Craig Franklin, E 111-1 Veterinary Medicine, Columbia, MO 65211-5120.

COURSES

400—Problems (1-99.9). Advanced studies not expected to terminate in a thesis. f,w,s.

410—Seminar (1). Theme-oriented seminars and discussions in the field of laboratory animal medicine and related areas; past topics have included: primates in biomedical research, transgenic animal technology, anesthesiology in laboratory animals, scientific writing, and ethics in biomedical research. Prerequisites: enrollment in Laboratory Animal Medicine Area Program and instuctor's consent.

437—Pathology of Laboratory Animals (4). (same as Veterinary Pathobiology 437). Gross and microscopic study of spontaneous and naturally occurring diseases in laboratory animals. Prerequisite: departmental consent. alt. w, even years.

450—Research (1-99.9). Research not expected to terminate in a thesis. f,w,s.

468—Laboratory Animal Biology (4). (same as Veterinary Pathobiology 468). Anatomy, taxonomy, reproduction, genetics, nutrition, behavior, and husbandry of common laboratory animals. Species emphasized include rodents, lagomorphs, ferrets, non-human primates, and cold-blooded vertebrates. Prerequisite: instuctor's consent.

469—Laboratory Animal Resource Management (4). Policies, standards and regulations in the care and use of laboratory animals, including colony management, animal procurement, cost accounting, facility design, and supervisory skills. Prerequisite: departmental consent. alt w, odd years.

475—Methodology of Animal Experimentation (3). Application of specific species or strains of animals and techniques to various types of biomedical investigation. Prerequisite: consent of department. alt. f, even years.

490—Research (1-99.9). Research expected to terminate in a thesis. f,w,s. Graded on a S/U basis only.

■ DOCTORAL PROGRAMS

Pathobiology Area Program

201 Connaway Hall (573-882-6550)

The PhD degree is offered in the Pathobiology Area Program, composed of faculty from the College of Veterinary Medicine, School of Medicine, College of Arts and Science, and College of Agriculture, Food and Natural Resources. The PhD degree requires 72 credit hours of work. In addition, the student must pass a written and oral comprehensive examination in the area of study, and write, present, and defend a dissertation which embodies the results of original and significant investigation by the candidate.

Graduate training relates to the major departmental thrust - application of advanced biotechnology to solving today's most perplexing agricultural, biomedical and companion animal questions. The faculty of the Department of Veterinary Pathobiology consists of scientists engaged in a wide variety of research programs supported by grants and contracts from government, foundations and private industry. Research is the foundation of graduate and postdoctoral study and students within the Department of Veterinary Pathobiology can expect to spend 75 percent of their time engaged in research activities. Additional details are available in the **Pathobiology Area Program** section.

Physiology Area Program

E-102 Veterinary Medicine Building (573) 882-7011

The Physiology Area Graduate Program resides within the Department of Veterinary Biomedical Sciences in the College of Veterinary Medicine. The program uses a multidisciplinary approach to biomedical research within which individual students may emphasize molecular, cellular, organ or integrative biology. The program seeks to provide in-depth training to meet the needs of the individual student.

DEGREE REQUIREMENTS: The general requirements and procedures published by the University of Missouri-Columbia Graduate School apply to all students admitted to the doctoral program in Veterinary Biomedical Sciences. MU requires a minimum of 72 semester hours beyond the baccalaureate degree for the PhD. Because of differing interests and variable backgrounds, the graduate program for each student is individually arranged, but will reflect a multidisciplinary approach to biomedical research. Each student in the biomedical sciences program is required to take all courses in the "core curriculum." These core courses consist of: Physiology (420 and 421, or 11 hours of equivalent courses); Cell Biology (333 or four hours of equivalent courses); "Multidisciplinary Approaches to Biomedical Sciences" (two hours). In addition to the core courses listed above, students take a minimum of one additional course in each of the following three areas: molecular biology, cellular biology and integrative biology. The choice of these courses will be made individually by the student in consultation with his/her adviser and doctoral program committee.

Following completion of the program of study, candidates for the PhD degree pass a comprehensive examination reflecting understanding of a multidisciplinary approach to biomedical sciences, as designed by the doctoral program committee. They then complete an original and meritorious research project, a dissertation, and final oral examination.

FACULTY

The faculty includes members from the Department of Veterinary Biomedical Sciences (College of Veterinary Medicine) and joint appointees (designated with an *) from the Department of Veterinary Medicine and Surgery (College of Veterinary Medicine).

M. Harold Laughlin, chair of veterinary biomedical sciences, professor, PhD, University of Iowa.
Ronald L. Terjung, associate chair, professor, PhD, University of Iowa.
V.K. Ganjam, professor, DVM, SV University-India, PhD, Oklahoma State University.
Lane L. Clarke, associate professor, DVM, University of Missouri-Columbia, PhD, North Carolina State University.
Calvin C. Hale, associate professor, PhD, University of Texas-Austin.
Eileen M. Hasser, associate professor, director of graduate studies, PhD, University of Oklahoma.
Meredith Hay, associate professor, PhD, University of Texas Health Science Center, San Antonio.
Cheryl M. Heesch, associate professor, PhD, University of Texas Health Science Center at San Antonio.
Elmer M. Price, associate professor, PhD, University of Cincinnati.
Leona J. Rubin, associate professor, PhD, University of Colorado.
James C. Schadt, associate professor, PhD, Texas Tech University.
Richard Tsika, associate professor, PhD.
Wade V. Welshons, associate professor, PhD, Harvard University.
John R. Dodam, assistant professor, diplomate ACVA, DVM, The Ohio State University, MS, PhD, North Carolina State University.

Women Studies

309 Switzler Hall (573) 882-2703

The Women Studies program does not offer a graduate degree, but some courses are available to graduate students.

COURSES

201—Topics (1-3). Organized study of selected topics in women studies. Subjects and earnable credit may vary from semester to semester. Repeatable up to 6 hours. Prerequisite: junior standing and/or105.

208—Historical Survey of Women Writers (3). (same as

English 208). A study of writing by women from the Middle Ages to the present. Prerequisite: sophomore standing.

220—Feminist Theory I: Comparative Feminist Ideologies (3). (same as Philosophy 220). Introduces central themes and problems in feminist thought, including conciousness-raising, motherhood, class, race, sexuality, nationalism, and transnational feminism. Prerequisite: 105 or graduate standing.

225—Modern French Feminism (3). Introduction to major literary andtheoretical texts by 20th century women writers, including an overview of contemporary French feminist thought. All work in English. Prerequisite: sophomore standing.

226—Latin American Women Writers (3). (same as Spanish 226). An introduction to major literary and theoretical texts by twentieth century Latin American women in translation. Readings and class work in English. Prerequisite: sophomore standing.

237—Women in African History (3). Focuses on the varied and changing roles of women in subsaharan Africa from precolonial times to the present. Prerequisite: sophomore standing or instructor's consent.

250—Black Women in American Politics (3). (same as Political Science 250). This course analyzes the role that Black Women have played in American politics from the Reconstruction eras civil rights and women's movements, and bids for elective official. Prerequisites: Political Science 1 or 11 and sophomore standing.

262—Sociology of Sex Roles (3). (same as Sociology 262). Examination of females and males in contemporary society as they are affected by culture; various institutional arrangements, including the labor market; interactive relationships; socialization; and sexism. Prerequisites: Sociology 1, 60 or equivalent.

264—Women and Science (3). Examines the experience of women scientist since 1800, concentrating on Europe and North America. Individual biography is the primary focus. Historical feminist, domographic, and sociological perspectives are discussed. Readings, class discussions, and papers are key to the course. Prerequisite: Sophomore standing.

265—Bodies, Identities, Politics (3). (same as Political Science 265). Introduces students to foundational premises of liberal political thought through examination of the dispute between Locke and Filmer. Analyzes subsequent rethinking of that debate in works by Rousseau, Wollstonecraft, nineteenth-century American slaves, contemporary feminists, and communitarians. Prerequisite: sophomore standing.

301—Topics (3). Problems, topics, issues or review of research in any area of women studies and/or experimental development of new content areas. Repeatable up to 6 hours. Prerequisite: junior standing and/or 105.

305—Women's Health (3). (same as Nursing 305). A survey of international and domestic women's health issues; considers historical antecedents and specific effects of sociocultural variables and economic development on women's health in developing and developed nations.

308—Major Women Writers (3). (same as English 308) Study of a limited number (1-3) of significant writers to be read intensively using contemporary feminist critical theory. Prerequisites: two courses in British or American Literature. Repeatable with department's consent maximum of six hours for 308 and 308A.

308A—Major African-American Women Writers (3). (same as Black Studies and English 308A). Study of a limited number (1-3) of significant African-American writers to be read intensively using contemporary feminist critical theory. Prerequisite: two course in British or American literature. Repeatable with department's consent. Maximum of six hours for 308 and 308A.

315—Themes in Literature by Women (3). (same as English 346). Examines works by a number of women writers with particular attention to their sociolpolitical context. May repeat to six hours with department's consent. Prerequisite: junior standing.

317—Women and the Media (2). (same as Journalism 317). Focus on portrayal of women in American mass media. Other goals: historical perspective on women as journalists; exposure to issues usually not covered by mass media; research and writing skills. Prerequisite: instructor's consent.

320—Feminist Theory II: Problems in Feminist Thought (3). Examines recent problems and critical debates within feminist theory. Prerequisite: 220 or instructor's consent.

341—Women and the Law (3). (same as Political Science 341). Women and the Law is a course that requires an extensive amount of reading and writing. Focus on legal issues which are relevant to women such as divorce, domestic violence, employment discrimination, pregnancy discrimination, rape, sexual harassment, and others. In addition, students will gain preparation for graduate or law study by analyzing cases, concepts and terms. Prerequisite: Political Science 1 or 11 and junior standing.

348—Caribbean Women Writers (3). Examines representative works by female authors from the Caribbean; primarily the English speaking islands. The depiction of Caribbean women will be a major consideration, as well as the unique qualities of Caribbean literature. Prerequisite: sophomore standing or instructor's consent.

350—Special Readings (3). Independent readings in women studies for highly qualified and motivated students. Topic selected in consultation with supervisory faculty member. Repeatable up to 6 hours. Prerequisite: junior standing and/or 105.

362—Feminist Research and Criticism (3). Examination of both feminist critique of traditional social research and recent, feminist-oriented research that attempts to answer these criticisms. Prerequisite: Sociology 180 or equivalent.

363—Women, Art and Society 1700-1920 (3). (same as Art History and Archeology 363). This course surveys and analyzes the careers and works of selected European and American women artists, and images of women (by female and male artists) in the 18th, 19th and first half of the 20th centuries. Prerequisites: junior standing, Art History 11 or equivalent, and instructor's consent.

366—Feminist Political Thought (3). (same as Political Science 366). This course examines the deployment of sexual difference in selected canonical works of the western political tradition, and it introduces students to important debates within contemporary feminist thought about the relationship between feminism and politics. Prerequisite: junior standing.

370—The Politics of Reproduction and Fertility Control (3). (same as Human Development and Family Studies 370). Examines the social construction of reproduction, including discourses and practices surrounding the body, pregnancy, birth, reproductive technology and diseases. Stresses the ethical issues and social policies affecting women. Prerequisite: junior standing or instructor's consent.

373—Global Perspectives on Women and Development (3). (same as Sociology and Black Studies 373). Examines the history and structure of "development" discourse and practices. Stresses the interconnections and impact on women globally. Reviews women's strategies in defining and instituting programs to improve quality of life in communities. Prerequisites: Sociology 110, Women Studies 111, Black Studies 111, or Women Studies 370.

377—Race, Gender and Ethnicity in Higher Education (3). (same as Black Studies, and Higher & Adult Education K377). Historical relationships of race, gender, and ethnic issues in United States higher education. Issues include: theory and research of curriculum and teaching, diversity within the the academy, and leadership, governance, and policy.

386—Women's Folklore and Feminist Theory (3). (same as English 386). Examines folklore and artistic expression of women in relations to feminist theory and in multicultural contexts. Includes verbal genres (narrative/song) as well as material genres (quilting/arts). Prerequisite: junior standing or instructor's consent.

390—Senior Research Seminar (3). Seminar for senior students engaged in some area of research in women studies. Students will compare and evaluate their individual projects and/or collaborate on a common theme. Prerequisite: instructor's consent.

University of Missouri-Columbia
Graduate School
210 Jesse Hall
Columbia, MO 65211

John Amann
Veterinary Biomedical Sciences
W143 Vet Medicine Building

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