UNIVERSITY OF MISSOURI
COLUMBIA

C A T A L O G

Graduate catalog

with course descriptions

1991 — 1993

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For more information call:

1(314) 882-6311

(in Columbia)

1(800) 877-6312

(outside Columbia)

Your application is on page 3.

Academic Calendar

Fall Semester

	1991	1992
Orientation & Registration	Th Aug 22	Th Aug 20
Registration	F Aug 23	F Aug 21
Classwork begins, 7:40 a.m.	M Aug 26	M Aug 24
Labor Day recess	M Sep 2	M Sep 7
Thanksgiving recess begins, close of day*	Tu Nov 26	Tu Nov 24
Classwork resumes, 7:40 a.m.	M Dec 2	M Nov 30
Classwork ends, close of day*	Th Dec 12	Th Dec 10
Stop Day	F Dec 13	F Dec 11
Final examinations begin	Sa Dec 14	Sa Dec 12
Fall semester closes, 5:00 p.m.	F Dec 20	F Dec 18
Commencement	Su Dec 22	•••••••

Winter Semester

	1992	1993
Orientation & Registration	Th Jan 16	Th Jan 14
Registration	F Jan 17	F Jan 15
Martin Luther King Jr. Holiday	M Jan 20	M Jan 18
Classwork begins, 7:40 a.m.	Tu Jan 21	Tu Jan 19
Spring recess begins, 12:30 p.m.	Sa Mar 21	Sa Mar 13
Classwork resumes, 7:40 a.m.	M Mar 30	M Mar 22
Classwork ends, close of day*	F May 8	F May 7
Stop Day	Sa May 9	Sa May 8
Final examinations begin	M May 11	M May 10
Winter semester closes, 5:00 p.m.	Sa May 16	Sa May 15
Commencement	Su May 17	Su May 16

Summer Session

	1992	1993
8-week session		
Orientation & Registration	M Jun 15	M Jun 14
Classwork begins, 7:30 a.m.	Tu Jun 16	Tu Jun 15
Independence Day recess	F Jul 3	M Jul 5
8-week session closes	F Aug 7	F Aug 6
First 4-week session		
Orientation & Registration	M Jun 15	M Jun 14
Classwork begins, 7:30 a.m.	Tu Jun 16	Tu Jun 15
Independence Day recess	F Jul 3	M Jul 5
First 4-week session closes	F Jul 10	F Jul 9
Second 4-week session		
Registration	M Jul 13	M Jul 12
Classwork begins, 7:30 a.m.	M Jul 13	M Jul 12
Second 4-week session closes	F Aug 7	F Aug 6
Commencement	F Aug 7	F Aug 6

*Close of day is defined as including late afternoon and evening classes, 10:00 p.m.

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GRADUATE APPLICATION FOR ADMISSION – UNIVERSITY OF MISSOURI-COLUMBIA

APPLICATION FEE: $20 MUST ACCOMPANY APPLICATION

UNIVERSITY OF MISSOURI-COLUMBIA GRADUATE APPLICATION

Please Print *(In Black Ink)* **or type and DO NOT Write in Shaded Areas**
See Additional Instructions on Reverse Side

MU Student Number [ ][ ][ ][ ][ ][ ][C]

1. Name (Last / First / Middle / Or other name)

2. Social Security Number [ ][ ][ ] [ ][ ] [ ][ ][ ][ ]

3. I would like information concerning financial aid. *(see instruction no. 6)* ☐ Yes ☐ No **4. Veteran of the U.S. Armed Forces?** [1] ☐ Yes ☐ No

5. Permanent Address and Telephone Number *(This address will be used for all University correspondence prior to your first registration)*

Number & Street or RFD No. | Apt. No. or Box No. | City

County | State | ZIP [ ][ ][ ][ ][ ] | Country | Area Code [ ][ ][ ] | Telephone Number [ ][ ][ ] [ ][ ][ ][ ]

6. Previously enrolled at MU or in MU extension courses? ☐ Yes ☐ No If yes,do not complete this form. Instead, complete a request to re-enroll (available from Admissions, 130 Jesse Hall)

7. Ever enrolled in Correspondence (Indep. Study) at MU? ☐ Yes ☐ No
If yes, when _____

8. Graduate program to which you are seeking admission: _____. (see back for listing)

Graduate Degree sought at MU? Master's _____ Educational Specialist _____

Doctorate _____ None _____ [ ][ ] [ ][ ][ ][ ] [ ][ ] [ ][ ]

9. Term of expected entrance *(Check one)* ☐ Fall ☐ Winter ☐ Summer Year: _____

10. Name and location of ALL colleges attended, Dates of attendance, Degrees earned or expected prior to enrollment at MU. If currently enrolled, indicate in date space. List schools beginning with most recent. Attach list if more space is necessary. (Failure to indicate colleges or universities in which you have been enrolled will void your admission.)

LVL-MOD [ ][ ] O.E.C. [ ]

NAME OF COLLEGE	LOCATION (CITY & STATE)	DATES OF ATTENDANCE	DEGREES EARNED	DEGREE DATES	CEEB ONLY
1.					[ ][ ][ ][ ]
2.					[ ][ ][ ][ ]
3.					[ ][ ][ ][ ]
4.					[ ][ ][ ][ ]

11. Previous to opening day of classes, will you have satisfied the 1 year residence requirement in Missouri?
[R] ☐ Yes [N] ☐ No *(See instruction no. 5)*

12. Date of Birth Month / Day / Year

13. Place of Birth City / State / Country

14. Religious Preference *(Optional)*

15. Citizen of the U.S.? ☐ Yes ☐ No Permanent Resident of U.S. ☐ Yes ☐ No
If no, what country? _____ *(see instruction no. 9)*

16. Have you taken the required graduate level examinations? ☐ Yes ☐ No *(See instruction no. 8)*
If yes, have these scores been submitted to MU's Graduate Office? ☐ Yes ☐ No
Indicate test and date: GRE ____/____ Month/yr. GMAT ____/____ Month/yr. MAT ____/____ Month/yr.

17. Legal Signature *(In Black Ink)* I authorize the University of Missouri-Columbia to maintain all my records under this name

18. Date

This information is optional and requested for purposes of reporting to Federal Compliance Agencies only and will not be used in determining admission status:

19.Sex
[M] ☐ Male
[F] ☐ Female

20.Ethnic Origin (Non-Citizen Permanent Residents of U.S. must designate ethnic origin other than Non-Resident Alien)
☐ American Indian/Alaskan Native ☐ Hispanic
☐ Asian or Pacific Islander ☐ White-Non Hispanic
☐ Black-Non Hispanic ☐ Non-Resident Alien (F or J Visa)

21. If you have corresponded with anyone or any other office at MU (other than with the Admissions Office) please list their names here.

Complete all items and return this form, with check or money order for twenty dollars ($20.00), to:
Director of Admissions, 130 Jesse Hall, University of Missouri-Columbia, Columbia, MO 65211
Questions for the Graduate School? Call 1-800-877-6312

Graduate Departments

Accountancy
Agricultural Economics
Agricultural Engineering
Agronomy
Anatomy and Neurobiology
Animal Sciences
Anthropology
Art
Art History and Archaeology
Atmospheric Science
Biochemistry
Biological Science
Business Administration
Chemical Engineering
Chemistry
Civil Engineering
Classical Studies
Communicative Disorders
Communication
Community Development
Computer Science
Curriculum and Instruction
Economics
Educational Administration
Educational and Counseling Psychology
Electrical and Computer Engineering
English
Entomology
Environmental Design
Extension Education
Consumer and Family Economics
Fisheries and Wildlife
Food Science and Nutrition
Forestry
French
Genetics Area Program
Geography
Geological Sciences
German, Russian and Asian Studies
Health and Physical Education
Health Services Management
Higher and Adult Education
History
Horticulture
Human Development and Family Studies
Human Environmental Sciences
Communication
Human Nutrition and Foods
Industrial Engineering
Journalism
Laboratory Animal Medicine Area
Library and Informational Science
Mathematics
Mechanical and Aerospace Engineering
Microbiology Area Program
Molecular Microbiology and Immunology
Music
Nuclear Engineering
Nursing
Nutrition Area Program
Parks, Recreation and Tourism
Pathology Area Program
Pathology
Pharmacology
Philosophy
Physics and Astronomy
Physiology-Medicine
Plant Pathology
Political Science
Practical Arts and Vocational-Technical
Education
Psychology
Public Administration
Public Health (Family and Community
Medicine)
Romance Languages
Rural Sociology
Social Work
Sociology
Spanish
Special Education
Statistics
Textile and Apparel Management
Theatre
Veterinary Biomedical Sciences
Veterinary Medicine and Surgery
Veterinary Microbiology
Veterinary Pathology
Post-Baccalaureate Special Student

Application for Graduate Admission

1. Former Students—Students who have previously attended MU need not fill out an application or submit a Request to Re-enroll (available from Admissions, 130 Jesse Hall).

2. Applications—Fill out this form completely and send it with check or money order for twenty dollars ($20) to the Director of Admissions, 230 Jesse Hall, University of Missouri-Columbia, Columbia, Missouri 65211. You also will need to have transcripts sent to the above address as explained below.

Failure to complete this form fully will void your admission. Providing misinformation concerning previous enrollment in other colleges or universities also will void your admission.

Some information requested on this form is required by Title VI of of the Civil Rights Act of 1964, Title IX of the Higher Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973, and will be reported to federal compliance agencies concerned with equal educational opportunity. We ask for this information in order to keep the records required by the federal government, and to prevent discrimination on the basis of race, color, religion, handicap, national origin or sex.

APPLICATION FEE—A check or money order made payable to the University of Missouri-Columbia for twenty dollars ($20) must accompany your application. The application fee for international students is forty dollars ($40). This fee is non-refundable.

3. Transcripts—No transcript will be accepted directly from you. You must have your previous schools send your transcript directly to the Director of Admissions, 130 Jesse Hall, University of Missouri-Columbia, Columbia, Missouri 65211. These official transcripts must include baccalaureate degree and any additional work. No action on your admission will be taken until all transcripts and your completed admissions form are on file with the Admissions Office.

All transcripts become the property of MU. After one semester, transcripts will be destroyed for those applicants who do not enroll at MU.

4. Application deadlines are set by departments. Contact the department directly for this information. Deadlines for unclassified graduate students are July 1 for the fall semester, December 1 for the winter semester, and May 1 for the summer session.

International students should refer to information furnished by International Admissions, 123 Jesse Hall for application deadlines.

5. Out-of-State Applicants—It is your duty to apply and register under the proper residence and to pay the proper tuition fees. A pamphlet giving detailed information on tuition and residence rules may be obtained from the Admissions Office, 130 Jesse Hall.

6. Financial Aid—An application for admission to MU does not serve as an application for financial aid. MU accepts either Family Financial Statement (FFS) of American College Testing or the Financial Aid Form (FAF) of the College Scholarship Service. Forms are available from the Office of Student Financial Aid, 11 Jesse Hall. These forms should be completed and received by March 1. Late applications will be considered according to the date received and the availability of funds.

7. Housing—An application for admission to MU does not serve as an application for housing. Student housing information and applications for University-owned residence halls are mailed to all who apply for admission. Beginning March 1, this material will be mailed to those who have applied for the fall semester. Material will be mailed October 1 to those who have applied for the winter semester and April 1 for those who have applied for the summer session.

8. The Graduate Record Examination (GRE)—All graduate students are required to submit the aptitude scores of the GRE prior to admission. A student may be admitted with permission from the Graduate Dean without test scores if the examination is taken during the first enrolled semester. **The student may enroll in a second semester only if the required test scores are on file in the Graduate School.**

Some departments require a test in place of the GRE, such as the Miller Analogy Test (MAT) or the Graduate Management Admission Test (GMAT). You should check the department requirement at the time of application.

9. International students must request and submit an International Student Application for Admission.

Send your applications to:
Director of Admissions
130 Jesse Hall
University of Missouri-Columbia
Columbia, MO 65211

MU AND THE GRADUATE DIVISION

MU

The University of Missouri-Columbia, established in 1839, is the oldest state university west of the Mississippi. 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 five most comprehensive and diverse universities in the United States. As a member of the American Association of Universities (AAU) and a university classified "Research I" by the Carnegie Foundation for the Advancement of Learning, 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 1989-90, MU received more than $62 million from outside sources in support of research and other scholarly activities. MU also enjoys broad support from the alumni.

The Graduate Division

The Graduate Division, which includes the Graduate School, the Office of Research, the Office of Sponsored Program Administration and several interdivisional research centers, has campuswide responsibility to promote, facilitate and support graduate education and faculty research, scholarship and creative achievement. 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 more than 5,000 graduate students in 97 graduate degree programs. The school granted 236 doctorates in 1989-90, which ranked it 47th in the nation in this regard. 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. Accordingly, the school includes the Office of Research, and the dean of the school also is the vice provost for research for the campus. Through the Office of Research and in the implementation of its various other programs, the school encourages quality research and creative activity, provides various support services for researchers and administers externally funded research grants and contracts awarded to MU personnel.

The Graduate School administers several interdisciplinary research units including the Missouri University Research Reactor, the Laboratory Animal Medicine Program, the Dalton Research Center, the Center for Research in Social Behavior and the Missouri Cultural Heritage Center. These units involve faculty from nearly half the departments at MU. In addition, the school supervises area graduate programs in which advanced degrees are awarded and area programs offering a minor field for graduate study.

Graduate education at MU is dedicated to the development of independent, creative approaches to problem solving and to experiential learning. The keys to success are thus 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 school and Graduate Faculty Senate committees. Students contribute to Graduate School governance and perhaps more important, 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 opportunities for external funding 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 by the graduate dean upon advice of the Research Council, members of which are appointed by the Dean of the Graduate School. A portion of the council's funds is reserved for summer research fellowships. Selection is competitive.

GOVERNANCE OF THE GRADUATE SCHOOL

The Graduate Faculty Senate, members of which are elected representatives of degree-granting departments and area programs, is the governing body of the graduate faculty. 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 communications 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 of the Graduate School: The Graduate School is directed by the dean who also holds the title of vice provost for research. This combination underscores the essential unity of graduate education and research. In addition to graduate and research responsibilities, the dean also serves as a member of the MU Committee on Promotion, Tenure and Membership and the UM System Doctoral Council. Three associate deans assist the dean in meeting the responsibilities of the school. Their responsibilities are broadly defined in the areas of fellowships and graduate student affairs (including minority recruitment), academic programs and research.

FACILITIES AND RESOURCES

Libraries

The libraries at MU include Ellis Library with its branch libraries in various locations on campus, collections in Tate Hall and one library annex. The libraries serve the entire University community with a collection of 2.4 million volumes, 4.8 million microforms and nearly 18,000 serial titles. A variety of services and staff are available to answer questions and help solve research problems. Brochures detailing services and hours are available in the libraries. The collections of the State Historical Society of Missouri and the Western Historical Manuscripts Collection augment the holdings of the libraries. The separately administrated Law Library contains the originals and the reprints of the English reports and those of the British empire consisting of the Australian, Canadian, Irish, Indian, Scottish, South African and Colonial reports. The library has an almost complete collection of federal and state reports and statutes. There is a good selection from various reporting services that publish administrative regulations and rulings, new court decisions, new statutes and amendments to existing laws.

ELLIS LIBRARY, the main library on campus, occupies an entire city block and houses more than 1.5 million volumes. Ellis Library contains the principal resources for research in the humanities, the social sciences and sciences.

Science resources include volumes in the biological sciences of agriculture, botany, zoology and related fields. Chemistry and physics are the principal resources in the physical sciences. These holdings are complemented by the biological and physical resources found in the branch libraries on other parts of the campus. Social science resources are strong in business and economics, political science, sociology, geography (including a map collection), library science, psychology and education. Education materials include an extensive microfiche collection from the Educational Resources Information Centers (ERIC).

The language and literature materials include extensive holdings in American, English and other national literatures, speech, theatre, linguistics and related resources. Additional humanities resources are represented by strong holdings in history, philosophy, religion, classics, art, art history and archaeology, anthropology and music. A Recorded Sound Collection of more than 10,000 recordings complements the music volumes.

Access to the collections is enhanced by an online catalog, LUMIN (Libraries of the University of Missouri Information Network), which contains records for most of the books and journal titles held by the campus libraries. The holdings of the libraries of the other three campuses of the University of Missouri System also are available through LUMIN.

SPECIAL COLLECTIONS

The Rare Book Collection is rich and varied. Its strength lies chiefly in the areas of illustrated books from the 16th-century to the 20th-century. Included are illustrated editions of Ovid's Metamorphoses, books of trades, books illustrating the themes "the dance of death" and "the book of fools" and emblem books. Works representing the Dada and Surrealist movement both as literary and artistic expressions are well- represented. Important samples of printing from the Incunabula period, the 16th-century, the English private press movement and contemporary U.S. and British private presses are available. Scarce works of literature, history and travel have been collected to aid researchers.

The American Speeches and Sermons Collection contains approximately 1,200 speeches and sermons printed in America before 1800 and about 500 Fourth of July orations delivered during the first half of the 19th-century.

The Johnson Collection, a gift of approximately 1,600 volumes from the library of the late Thomas Moore Johnson of Osceola, Mo., was received in 1947. The collection consists principally of works in philosophy, especially Plato and the Neoplatonists.

The Howey Collection of 16th-, 17th- and 18th-Century English Tracts provides a wealth of material important in the study of English politics and religious history. The collection of 22,000 titles includes pamphlets by prominent divines, political leaders and literary figures.

The Tamony American Language Collection, acquired in 1986 as a part of the Western Historical Manuscript Collection and MU's libraries, is the life work of the late Peter Tamony, a self-taught etymologist and historian of American popular language. The eight tons of card files, books and records could make MU a center for the study of American vernacular.

Other gifts and special collections donated by friends of the University continue to strengthen the library's holdings. Outstanding gifts include a previously unpublished manuscript of Charlotte Bronte; the library and manuscripts of John Neihardt; the library of the late Dr. Frank Luther Mott; the William Peden collection of 20th-century literature; the William Kerr collection of limited editions and the Antony DeBellis collection of Italian Literature and History.

THE MICROFORM COLLECTION is the sixth largest among members of the Association of Research Libraries. The collection contains more than 1,000 newspaper titles, including 26 current major dailies, numerous periodicals, and an extensive collection of early American periodicals.

The collection consists of large sets of early state records, American and early British government documents, papers of U.S. presidents and other important individuals and more than 230 collections of U.S. government reports, including National Archive record groups, military intelligence reports, CIA reports and diplomatic histories. A number of black history collections are available. Ellis Library also houses large collections of English imprints to 1700 and American imprints to 1820.

REFERENCE RESOURCES AND BIBLIOGRAPHIES: The library's collection of reference resources contains more than 40,000 volumes. The standard American and British national bibliographies and the principal ones of France, Germany, Italy, Spain and other nations are available, as are subject bibliographies and abstracting and indexing services.

GOVERNMENT DOCUMENTS: The library has been a repository for federal documents since 1862 and has a comprehensive collection of older as well as recent government publications. Since 1986, when the library was designated a federal regional depository, it has received all federal documents distributed by the superintendent of documents. (The Law Library is a selective depository.) A depository system for Missouri documents was set up in 1977 with the Ellis Library designated as a depository library. Selected Missouri documents before 1977 also are available. The library receives microfiche copies of the official records of the United Nations. Major documentary publications of foreign nations also are available (journals of the House of Lords and House of Commons, Journal Officiel de la Republique Francaise). These collections contain more than 400,000 pieces. The Government Documents area is on first floor east.

LIBRARY SERVICES

Reference and interlibrary loan librarians who are bibliographic specialists can aid graduate students in their research. Their services include the location of printed and manuscript materials in other libraries in the United States or abroad and the

acquisition of photo or microfilm copies of scarce items that cannot be secured in any other form.

The library is a member of the Center for Research Libraries of Chicago, through which the member libraries store and acquire lesser-used research materials, including either international newspapers or on microfilm from international countries.

Literature Search Services: MU's libraries offer online data base searching of periodical indexes, abstracting services, books and data files. The result of a computer search is either a printed or downloaded bibliography tailored to the researcher's topic. The libraries have access to more than 200 data bases in virtually all subject fields. The data bases include materials from journals, books, conference papers, reports, government documents and other resources. Some heavily used data bases are in CD/ROM format and can be searched free of charge. Others are available online and can be searched by librarians during the day or in the evening at a substantial discount. Users of either the daytime or evening search service pay the direct costs of the search, and the library will assume most overhead costs.

Reserve Desk and Seminar Rooms: Some reading materials for class assignments may be placed at the Reserve Desk on the first floor or in seminar rooms on several floors of the libraries. This is done at the request of the course instructor.

Library Instruction geared to graduate students is conducted by subject-area librarians who have knowledge of bibliographic resources in specific disciplines. Sessions are conducted at the request of instructors.

Services for People with Disabilities: The entrance to the library on Conley Avenue is accessible to people with disabilities, and there is an elevator in the east wing. Library services for those with special needs are available from the coordinator of library services for the disabled, on first floor south.

Microcomputing Lab is on the north side of the east wing on the fourth floor. IBM and Apple Macintosh personal computers are available for student use. Software can be checked out at the Reserve Desk, first floor north.

LIBRARY FACILITIES

Ellis Library provides seating for more than 1,000 readers. For the use of graduate students who qualify, there are 76 carrels; 400 individual book lockers are available to any student. Nine seminar rooms, each seating 10 to 14 people, are available for specialized graduate study. Microfilm and microfiche readers (fourth floor west) are available to the student. The library also maintains photocopy equipment (Room 115, first floor north) with which, for a small fee, copies may be made of most library materials.

Current Periodical Reading Room (first floor west): Unbound issues of most periodicals received in Ellis (approximately 6,000) are shelved in this area. Bound volumes are shelved in the stacks. Copy machines also are available in this area.

Branch libraries and book storage facilities: The Engineering Library, 2017 Engineering Building, contains 69,338 volumes and currently receives more than 500 periodicals. Its collection encompasses chemical, civil, electrical, industrial, nuclear, and to some extent, agricultural engineering materials.

The Geology Library, 201 Geological Sciences Building, receives over 686 current periodicals, has a collection of 59,431 volumes and 125,000 maps covering all aspects of geology.

The J. Otto Lottes Health Sciences Library, M210 Medical Science Building, collects materials on medicine, nursing, health services management and paramedical fields. Collection includes 180,000 books and 1,800 current periodicals.

The Journalism Library, 117 Walter Williams Hall, receives more than 350 current periodicals, and its collection of 23,674 volumes covers mass communications, advertising, magazines, graphics and public relations.

The Mathematics Library, 206 Math Sciences Building, collects materials dealing with mathematics, statistics and computer science. It receives more than 400 current periodicals and has 43,275 volumes.

Tate Hall Library, 200 Tate Hall, houses older collections of language, literature and history books cataloged in the Dewey Decimal classifications.

The Veterinary Medical Library, W218 Veterinary Medicine Complex, receives 643 periodicals and has a collection of more than 33,000 volumes that deal with all aspects of veterinary medicine.

Staff are available in each branch library to offer services such as circulation, reserve reading, reference and information, online searching, interlibrary loan, tours and lectures on bibliographic resources.

The Library Annex holds more than 400,000 volumes. Ask at Ellis's circulation desk to obtain these materials.

THE LIBRARY OF THE STATE HISTORICAL SOCIETY AND OTHER SPECIAL COLLECTIONS in Ellis Library, has an extensive collection of Missouri and the early West. This collection comprises 480,000 volumes for research, including bound volumes of Missouri magazines, college periodicals and Missouri official publications; 800 bound volumes of Missouri newspapers and more than 31 million pages of Missouri newspapers on microfilm; 6,545 rolls of U.S. Census material, covering Missouri and 48 other states; more than 300,000 pages of original manuscripts, 1.5 millionpages of manuscripts on microfilm and scrapbooks, World War I and World War II letters, records and clippings; 2,400 maps; more than 75,000 photographs; 6,200 original cartoons; plus engravings, lithographs, paintings, portraits, drawings and other art properties.

THE WESTERN AMERICANA COLLECTION features material on Missourians and the Great Plains. Similar general boundaries have been set up for the manuscript collection. The book collection naturally spills over to follow the Oregon and Santa Fe trails and the westward movement to California. Missouri's part in the development of the West brings much of Western historical materials within the field of Missouriana and ties the state closely with all phases of the early history of the West. The collection has been developed in close connection with the State Historical Society, which is especially strong in Western materials, so duplication has been held to a minimum. In 1941, the society acquired the J. Christian Bay Collection of Western Americana, containing many of the rarest printed items relating to the West. The society's library also is noted for its outstanding collections of Mark Twain and Eugene Field.

Ellis Library acquired a special collection of about 1,000 volumes of Western Americana in 1940, bringing its holdings in this special field to about 6,000 volumes. Several hundred volumes a year are being added. The libraries of the University and the State Historical Society contain original or film copies of a large percentage of the important titles relating to the West. The collections are especially rich in travel narratives and contemporary accounts of life among the pioneers. They also contain some unusual Indian items.

THE WESTERN HISTORICAL MANUSCRIPT COLLECTION, established in 1943 with the assistance of the humanities division of the Rockefeller Foundation, was consolidated in 1962 with the State Historical Society's manuscripts as a joint collection. In 1968, it became a University of Missouri System operation and now occupies divisions in the libraries of the UM System. Materials may be loaned among the four divisions. The primary objective of the collection is the acquisition and preservation of materials relating to the Missouri River region and the Great Plains. Materials collected are letters, diaries and personal accounts of travelers, business and professional records, and memoirs of early western people, as well as the organizational records pertaining to all of the history of Missouri. Photographic equipment is available for reproducing rare papers that cannot be acquired in the original.

THE LIBRARY OF THE DEPARTMENT OF ANTHROPOLOGY AND THE MISSOURI ARCHAEOLOGICAL SOCIETY, combined, have extensive collections in anthropology with special emphasis upon Mesoamerican and Midwestern

MU is one of the five most comprehensive and diverse universities in the United States, and it is a premier provider of graduate and professional education.

U.S. archaeology. The Missouri Archaeological Society, through an exchange arrangement with other archaeological societies, has journals and serials extending back to the 1930s. For more information, call the Department of Anthropology at (314)882-4731.

THE GEOLOGY LIBRARY AND MAP COLLECTION consists of 59,000 volumes, including 686 periodicals and 373 other report and map series. Collection policies are targeted to the research and teaching interests of the Department of Geological Sciences faculty. The Geology Library contains an especially strong collection of historical geological materials. The collection also holds many of the publications of the earliest of the state geological surveys as well as the publications of the four original national geological surveys. The map collection consists of more than 125,000 sheets. Four thousand new sheets are received each year, primarily through the distribution programs of various government agencies. The map collection contains both topographic and thematic maps. Topographic coverage is available for the entire United States and its possessions at scales of 124,000, 162,500 and 1,250,000, with some metric topographic coverage available at scales of 125,000 and 1,100,000. Selected computer-enhanced photography, such as orthophotographic imagery, is available at the 124,000 scale. The thematic map collection, primarily geologic in nature, contains a substantial number of geological maps published by the U.S. Geological Survey and various state geological surveys. The collections also receives geologic maps from national agencies of Canada, Great Britain, South Africa, India, Australia and New Zealand. Some non-geologic thematic maps also are part of the collection, such as the 1,250,000 land-use series of the U.S. Geological Survey.

LAWSON COLLECTION OF CRIME AND CRIMINOLOGY, consisting of about 1,500 volumes, is part of the Law Library. For the most part, the publications are reports on famous trials written in popular style. They were used by Dean Lawson in the preparation of his American Trials. The Law Library currently is placing the collection on microfiche.

Media Development Services

THE ACADEMIC SUPPORT CENTER provides the following media development services for faculty and staff at MU.

Graphics Development: Charts, graphs, line drawings, illustrations, displays, posters, poster sessions, brochures, and computer graphics for slide or video presentations and print publications.

Photography: Wide range of color and black and white photographic services. Original photography, location, studio, technical photography, specialized processes and systems, development, printing slides, duplication and packaging.

Audio/Television Production: Development of both creative productions and technical documentation in audio or video. Studio or location production, post-production, editing, mixing and release duplication. Current video and audio recording formats available for duplication.

Technical Services: Equipment utilization and purchase consultation, shop and field maintenance of television/audiovisual hardware and system design.

Film Library: More than 2,500 video and 6,000 16mm film titles available for preview, reference or presentation. Audiovisual and television equipment is available for short-term presentation use.

Learning Laboratory: Modern language interactive systems, audio listening stations, and video review stations available to students enrolled in courses using the laboratory for supplemental access to media materials.

Media Labs: Audio and television production facilities available to students enrolled in various media courses using the facilities as a part of the course of study.

Campus Computing

Faculty, staff and students at MU have the choice of working on the University-owned mainframe computer or on one of the many microcomputers in the public access instructional computing labs across campus.

MU owns and operates an IBM 3090-170J mainframe computer running the VM/CMS operating system. This computer (UMCVMB) is accessible 24 hours a day either through hardwired work stations on campus or through dial-up from an asynchronously attached work station.

UMCVMB users have access to a variety of application software, including ISSCO graphics packages, SAS, Spires, SQL and UNIX. Output from these programs can be sent to a CalComp color plotter or one of seven Xerox 3700 laser printers across campus. Extensive online help and documentation is available for most of the programs on the mainframe computer.

Users also can take advantage of the FPS-164 array processor attached to the 3090 computer. This processor currently accepts FORTRAN compiled jobs that require extensive array manipulation.

From any terminal on campus, or through dial-up to the computer system, users can access the University's online catalog system, LUMIN. Users also may communicate with other computer users across the country through the BITNET network. Another network, MIDNET, gives UMCVMB users access to 14 other university computer systems in the Midwest, including the NSF super computers.

More than a dozen instructional computing labs are in buildings around campus. These labs contain a variety of equipment, including mainframe terminals, IBM PC's, Apple MacIntoshes and laser printers for high-quality output. Several of the instructional labs have local area networks to share file servers and printers. Most labs are accessible to people who are physically disabled, and many contain electronically adjustable tables for people with mobility impairments.

Users may either bring their own microcomputer software or check out what they need and use it while they are in the sites.

Software available includes word processing packages, spreadsheet programs, data base applications and graphics packages. Each lab is staffed to provide users with assistance. If users would like more in-depth assistance, short courses are taught each semester on various computer applications.

As an extension of the mission to provide and support access to the computing resources of the University, a purchase program has been established to provide microcomputer hardware, software and peripherals to eligible University members at a substantial discount. Site license agreements with several vendors also have been established to provide microcomputer software at no cost or at greatly reduced prices.

Museums and Collections

MUSEUM OF ART AND ARCHAEOLOGY: The Museum's exhibition galleries are on the second floor of Pickard Hall on historic Francis Quadrangle. The collections include more than 11,000 art objects, representative of all parts of the world and all periods from paleolithic to the present. The greatest strengths are in ancient art and archaeology of the Near East, Egypt, Greece and Rome; African and pre-Columbian art; old master paintings (with the Kress Study Collection as its core); South and Southeast Asian art, drawings and prints. There are small collections of Chinese, Japanese and Early Christian (Coptic and Byzantine) art. A large amount of material from the Museum's excavations at Tel-Anafa in Upper Galilee is available for students of archaeology. The Museum publishes the annual newsletter *MVSE*, which includes articles about objects in the Museum by staff, faculty, students or scholars from outside the University.

The first floor of Pickard Hall houses the Department of Art History and Archaeology and the Gallery of Casts of Greek and Roman sculpture, exhibiting nearly 50 full-size plaster copies of many of the most famous classical statues.

ANTHROPOLOGY MUSEUM: Hours are 9:30 am-noon and 1:00 pm-5:00 pm Tuesday through Friday, 9:00 am-1:00 pm Saturday during school sessions. The museum gallery, in 100 Swallow Hall, contains exhibits of Missouri and American Indian archaeological and ethnological materials, physical anthropology and anthropological specimens from other areas of the world. The museum displays exhibits on the second floor of Jesse Hall that change periodically.

The museum publishes the Museum Briefs series and other

occasional papers.

THE WILBUR R. ENNS ENTOMOLOGY MUSEUM, in 3-38 Agriculture Building, contains more than a million specimens. The museum is used primarily for research and education, however, a partial collection is on exhibit for visitors between 9:00 am and 4:00 pm most work days during the year, or by appointment.

This is the largest collection of Arthropoda in Missouri and is especially rich in 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 (314)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, 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 here.

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 (314)882-6785.

THE HERBARIUM, 226 Tucker Hall, is valuable for research conducted by students and professionals. In this plant collection, 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 200,000 specimens includes nearly 35,000 mycological specimens, 1,000 algal specimens and about 30,000 specimens unprocessed. 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. The mycological collection is housed in Waters Hall, first floor, and Merton Brown is curator.

FISHERY AND WILDLIFE COLLECTIONS: The School of Forestry, Fisheries and Wildlife maintains an extensive teaching and research collection of the vertebrate animals of Missouri and surrounding states. The bird and mammal collections in Stephens Hall contain more than 7,000 specimens. The Glen Smart waterfowl collection, consisting of more than 200 species of mounted waterfowl of the world, is on display in the lower corridor of LeFevre Hall. The fish collection in Stephens Hall contains nearly 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.

Research Centers and Resources

THE CENTER FOR RESEARCH IN SOCIAL BEHAVIOR is a research and training facility operated by members of the social science faculty. It was established in 1966 to incorporate the activities of the earlier, less formally constituted, Social Psychology Laboratory. The center is supported by research contracts, grants and state funds administered through the Graduate School. The goal of the center is to conduct and to promote social science research at MU. The center provides facilities, equipment, office accommodations and services needed in programs of field and laboratory investigation; maintains a social environment in which research and graduate training in the social sciences are facilitated; and sponsors lectures, seminars and visits from scholars in the social sciences from this campus, from other campuses in this country and abroad.

B&PA RESEARCH PROGRAMS: The College of Business and Public Administration's facilities and 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 data base of financial, economic and demographic information describing characteristics of the nation, the states and their subdivisions. Major data holdings include the 1980 Census, Bureau of Economic Analysis Regional Economic Information System, Missouri Economic Information Retrieval System, National Bureau of Economic Research Time Series Data Bank 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 of finance, but special emphasis is currently placed upon topics in financial institutions and markets, financial regulation and public utility finance and regulation.

THE FREEDOM OF INFORMATION CENTER, maintains files that document actions by government, media and society affecting the movement and content of information. Founded in 1958 and dedicated to the people's right to know, this special library provides reference and referral services.

THE UNIVERSITY OF MISSOURI PRESS publishes approximately 50 scholarly books a year. Submissions are accepted from scholars across the nation. The press specializes in areas of literary criticism, history, intellectual thought, regional studies, and art history, and publishes a limited number of titles in original poetry and short fiction.

THE JOHN M. DALTON RESEARCH CENTER is a multidisciplinary facility devoted to basic health-sciences related research and to graduate and postgraduate training. Housed

Mizzou has the world's first journalism school, the oldest agricultural experiment field west of the Mississippi River, one of the nation's first electrical engineering departments and Missouri's largest research library.

in a modern building in Research Park, south of campus, the center has excellent facilities for modern research in physiological, biochemical and bioengineering studies. Research programs in the center are directed toward problems in cardiovascular control and physiology and related instrumentation; biochemical studies of the mechanism of cellular toxicity of oxygen and the superoxides; studies of the cyclic nucleotides and their role in cellular function; peritoneal dialysis for patients with kidney disease; biocompatible materials; basic research in biomedical ultrasonics and in mammalian cell genetics and the role of mutagenic and carcinogenic agents. 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.

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. Aureomycin was discovered on Plot 23. The Agricultural Research Park was developed to provide the facilities to conduct experiments under controlled environmental conditions.

Nine facilities are operated adjacent to Columbia. These include the Ashland Wildlife Area, South Farms, Foremost Dairy Farms, Rocheford Turkey Farm, Horticulture Farm, 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 off-campus research centers

The Delta Center at Portageville is the home for extensive research on plant breeding, variety testing, weed control, soil fertility, insect control and irrigation. Chief crops studied on the 975-acre site include cotton, soybeans, corn, grain sorghum, wheat, barley and rice.

The Forage Systems Research Center near Linneus contains 1,200 acres of rolling land typical of much of northern Missouri. Year-round controlled grazing systems of warm season and cool-season grasses and forage legumes are evaluated. Animal performance on the forage systems are evaluated for the environmental and economic impacts and benefits.

The Lee Greenley Jr., Memorial Center at Novelty includes 700 acres and is designed to emphasize research on energy conservation in agriculture. The center has the longest continuous corn tillage study in the Midwest.

The North Missouri Center 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 is the keystone of the center's program.

The Southwest Missouri Center at Mount Vernon includes 898 acres. Activities at the center are aimed at helping the area's dairy and livestock economy. Three new cool-season grass varieties have been developed and tested here during the past decade.

The University Forest is 14 miles north of Poplar Bluff. The 7,150 acres are owned by the Missouri Department of Conservation and is forested in upland hardwood cover types and some shortleaf pine. The University owns 160 acres and 22 buildings that house research laboratories, greenhouse, sawmill, wood processing plant, office, shops, resident forester's house, classroom, student and faculty cabins and dining hall.

THE MISSOURI RESEARCH REACTOR, in Research Park one mile south of campus, is the highest neutron flux university research reactor in the United States. Known throughout the world by its call letters MURR, the facility provides intense sources of neutron, gamma and neutrino radiation for research and technical applications. The facility complements other radiation sources such as X-rays, infrared and ultraviolet light and ultrasound to provide academic researchers a complete set of diagnostic capabilities. Experimenters from more than two dozen MU departments conduct research at the reactor. The facility also is available to researchers from other universities and from government and industry.

Examples of recent research conducted using the reactor are: making radioisotopes for cancer treatments (yttrium glass microspheres for liver cancer treatment, radioactive samarium for bone cancer treatment and radioactive rhenium attached to monoclonal antibodies for colorectal cancer treatment); identifying the source of obsidian artifacts to explain the trading patterns of prehistoric Indians; helping to develop "MagnaQuench," a new hard magnetic material that was used by General Motors Corp. in its Sunraycer solar powered car; following the course of zinc and selenium in animals; and developing improved fuel elements for nuclear reactors.

The reactor supports more than 90 research projects by 74 faculty and 68 graduate students from 36 departments of the University of Missouri System.

THE LOW LEVEL RADIATION LABORATORY, in Agricultural Research Park and operated by the College of Agriculture, Food and Natural Resources, 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 man, 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.

THE ELECTRONIC INSTRUMENT LABORATORY, in the Physics Building, is capable of designing, building and maintaining complex electronic research systems, instruments, computers and peripherals. The staff also advises research personnel on research project approaches and feasibility, equipment and component procurement, equipment use and enhancement and microcomputers.

THE ENGINEERING ELECTRONICS SHOP has the expertise to maintain and repair a variety of electronic equipment, including instrumentation and control electronics, computers and peripherals, and special research equipment such as robotic arms. In addition, this shop can provide the resources for design and development of custom equipment ranging from simple counting circuits through complex microprocessor-based devices. A facility is available for design and fabrication of printed circuit boards. The shop is in 29 Electrical Engineering Building. For additional information contact Earl Caruthers at (314)882-6477.

THE SCIENCE INSTRUMENT SHOP AND THE GLASS-BLOWING SERVICE have facilities and personnel to design and build sophisticated research equipment or to modify research equipment to meet the specific needs of the investigator. 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.

THE MISSOURI CULTURAL HERITAGE CENTER provides a base for multidisciplinary research projects. It develops courses and opportunities for student involvement in historic preservation and cultural heritage studies. It also offers outreach programs focusing on the region's cultural and environmental history. Faculty participate in projects as faculty associates or project investigators. Students are involved as interns, research assistants, special staff or volunteers. In historic Conley House, the center serves as a clearinghouse for cooperative projects, creates exhibitions and public programs for local and statewide audiences, and maintains a museum of Missouri cultural heritage.

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. The magazine is widely recognized as one of the best, if not the best, literary magazines in the country. Writer's Digest has called it one of the most influential magazines in the country, and The Christian Science Monitor named it one of the top five.

English 405 offers internships in literary publishing in which students have the opportunity to study with the editors and gain practical experience on the magazine. The purpose of the course is to learn as much as possible about the history of literary magazines and the process of editing. Students will participate in the actual editing of future issues of The Missouri Review. Because the most difficult aspects of literary editing involve a detailed sense of style, much of the work will arise from particular manuscripts and manuscript decisions.

THE THOMAS S. BASKETT WILDLIFE RESEARCH AND EDUCATION CENTER is a 2,300 acre facility 20 miles southesast of Columbia that is 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 close proximity to campus make it attractive to researchers looking for an outdoor laboratory. Opportunities exist to conduct investigations on diverse terrestrial, flora and fauna populations. Recent research activity has emphasized determining habitat requirements of wildlife species, entomology, forestry, fisheries, and wildlife habitually use the Center. Much of the funding support for these activities comes from outside grants. The Center is also used to carry out the extension and teaching missions of the School.

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

STUDENT SUPPORT

Services

The vice chancellor for student affairs, 211 Jesse Hall, provides administrative support and supervises student services to enhance the teaching, research and service missions of the University.

HOUSING: All students may reside in any available housing they choose, whether University-supervised or off-campus. Students interested in University-owned housing may request information by writing the Department of Residential Life, 125 Jesse Hall. Single student housing applications/ brochures are mailed in late February and biweekly thereafter to all students who have applied for admission. Brochures and applications for University student apartments (for family students and a very 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 1990-91 rate for one half of a double room and 20 meals a week is $2,851 an academic year. Payments may be made in installments.

Graduate and professional students may prefer Smith Hall, which is designated for them. Smith 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 two people, but single occupancy may be available. A kitchenette and four area lounges are provided on the ground floor. The building is locked at all times and residents enter using a magnetic keycard. Computer terminals are in adjacent Blair Hall. Students living in Smith Hall have an UPfront option, predeposit, declining balance plan. A portion of the monthly rate plus a 10 percent bonus is deposited in the student's meal account. As meals are eaten, the meal price is deducted from the account. The Upfront plan is accepted at the seven dining halls, at snack bars in the residence halls and at the Campus Dining Services' restaurants on campus.

University Student Apartments: Mizzou has 352 unfurnished apartments primarily for student 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 for $212 a month and two-bedroom apartments for $242 a month.

Off-Campus Housing: Some operators of off-campus housing list rooms and apartments with Residential Life. A listing may be obtained at A017 Brady Commons. The University does not serve as an agency for these operators. Residential Life does not inspect or approve off-campus housing and assumes no responsibility for the accuracy of information given. It should not be assumed that accommodations listed are more desirable than those not listed.

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.

HEALTH SERVICE: Student Health Center is in Noyes Hall west of the columns between Francis Quadrangle and South Sixth Street. Low-cost charges are made for services and students may be seen without an appointment. Clinic hours are 8:00 am-to-5:00 pm Monday through Friday. Emergency care is available at University Hospital and Clinics' Emergency Room. Students are responsible for all costs of medical care.

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.

THE CAREER PLANNING AND PLACEMENT CENTER, 110 Noyes Hall, offers a number of services to help students clarify career plans. The center also assists students in identifying internships and in locating part-time employment. Schools and colleges also provide specialized placement services for students.

THE COUNSELING CENTER, 220 Parker Hall, provides confidential counseling for individuals with personal, educational or vocational concerns. Group counseling such as adult children of alcoholics, interpersonal growth groups, stress management also is available.

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 the faculty and administration. GSA is under the umbrella of the Graduate-Professional Council.

The Graduate School has awarded 46,387 master's degrees, 8,619 doctoral degrees and 860 educational specialist degrees.

As a divisional student government, GSA derives funds from the student activities fee. GSA projects include the annual publication of the Graduate Student Handbook and Calendar, welcome tables during fall and winter registration, recognition of graduate students with the Superior Graduate Student Achievement Award, and distribution of small grants to graduate student groups. For more information, call the Graduate Student Association at (314)882-6737

GRADUATE-PROFESSIONAL COUNCIL: All graduate and professional students are members of the Graduate-Professional Council (GPC), the official student government for graduate and professional students. Formed in 1982, GPC is an umbrella organization whose purpose is to unite students enrolled in the Graduate School, School of Law, School of Medicine and College of Veterinary Medicine. The council is an opportunity for students interested in the quality of their educational experience to become actively involved in the decision making that affects every graduate-professional student on campus. The council informs graduate and professional students about campuswide activities; provides a forum for graduate and professional students to voice concerns and positions on important issues; provides formal representation of graduate- professional student interests and opinions to the faculty, administration and other governing bodies; sponsors academic and cultural programming, as well as cultural social projects for the benefit of graduate and professional students; and promotes the achievements and contributions of graduate-professional students to the University and community at large.

THE OFFICE OF FELLOWSHIPS AND GRADUATE STUDENT AFFAIRS: The Graduate School created the office in 1979 to facilitate increased enrollment of minority, women and handicapped graduate students. It works in cooperation with directors of graduate studies to increase the enrollment and, reduce attrition of women, minority students and students with mental and physical disabilities and thereby, achieve MU's affirmative action goals. In 1988, the unit was expanded to include fellowship administration and recruitment of all graduate students.

The objectives of the office are:

- to identify students through enrollment marketing who have the interest and potential for graduate study
- to maintain special marketing efforts designed to identify women, minority and students with mental and physical disabilities who have the interest and potential for graduate studies and to enhance their awareness of program offerings and career opportunities at MU
- to assist departmental efforts to recruit and retain these students
- to maintain a central clearinghouse of fellowship information and resources
- to identify and extend support services, ensuring the success of women, minority and handicapped students in the Graduate School

FINANCIAL AID: To apply for need-based financial aid, first complete a need analysis form. You may use the American College Testing (ACT) Family Financial Statement (FFS), the College Scholarship Service (CSS) Financial Aid Form (FAF), or the United Student Aid Funds (USAF) SINGLEFILE Form. A high school or college in your area should have one of these forms. Mizzou does not accept the Graduate and Professional School Financial Aid Service Form (GAPSFAS). In order to have your money available by the start of the fall semester, mail your application by March 1. Once MU knows how much financial aid you are eligible to receive, we try to meet your need with various aid programs. Need-based aid is awarded using the information you supplied on the need analysis form. In addition some non-need-based supplemental loan programs are available to all students. In 1989-90, 754 graduate students (approximately 15% of the total graduate enrollment) received need-based financial aid in the total dollar amount of $4,782,150 for an average per awardee of $6,462.

Eligibility: To receive federal financial aid, you must:

- be a U.S. citizen, permanent resident, or an eligible non-citizen
- enroll at MU in a degree-seeking program (If you are a post-baccalaureate or unclassified graduate student, please call our office 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

Short-term loans are available to assist you in an emergency. Amounts are determined on an individual basis. Visit the graduate financial aid coordinator if you have an emergency. The interest rate is 8 percent and the loan must be repaid by the end of the semester. Allow two weeks for processing.

Special Circumstances: Your financial aid need will be based on your 1990 income. If your total 1991 income is going to be less than your 1990 and you would like your situation reviewed, contact the graduate financial aid coordinator in the Financial Aid Office, 11 Jesse Hall, Columbia, Mo. 65211 after you receive your need-analysis confirmation. If you prefer to call, our toll free number in Missouri is (800)829-1100. Out-of-state call (314)882-7506.

THE MINORITY STUDENT OFFICE, A037 Brady Commons, provides academic and personal support services for members of minority groups and sponsors a series of programs to encourage a sense of community within the University. A calendar of events and activities is published each semester.

THE ACCESS OFFICE FOR STUDENTS WITH DISABILITIES, A048 Brady Commons, coordinates special services available to students with mental and physical disabilities. These include wheelchair repair, a study center with audio tape materials and vision aids, special lift-equipped buses and modified physical education courses. The program works with various services on campus to increase accessibility and enable students to participate in regular student activities and student life.

THE OFFICE OF INTERNATIONAL STUDENT PROGRAMS, A02 Brady Commons, provides special services for international students, faculty and staff, including advice about legal immigration status. The office coordinates cultural and educational programs and advises international student organizations.

VETERANS: The Office of Special Services, 123 Jesse Hall, 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.

Financial Aid

THE OFFICE OF FELLOWSHIPS AND GRADUATE STUDENT AFFAIRS administers the following fellowship programs:

Gregory Fellowships currently provide $5,000 stipends for new students. A Gregory fellow is exempt from nonresident tuition and is allowed to hold a half-time departmental teaching or research assistantship. Application forms may be obtained from the department or area in which the student intends to work and must be completed and returned by March 1.

G. Ellsworth Huggins Graduate Scholarships provide $10,000 stipends for up to four years for new students who intend to pursue the PhD degree. Students must be enrolled in a department or area that offers the PhD for the fall semester in the year in which the award is to be made. Huggins scholars are not permitted to accept supplementary appointments during the first two semesters of graduate study. Due to stipulations of the award, special consideration is given to students from Lamar Mo. High School, and from Barton County, Mo. Application forms may be obtained from the department or area in which the student intends to work and must be completed and returned by March 1.

The D. R. Francis Fellowship competition is open to undergraduate seniors planning to attend Graduate School or to graduate students already enrolled at MU. Applicants must plan to study in the areas of public affairs or creative literature and are required to submit, along with the application form, a brief statement describing the plan for study. The stipend is $2,500 for

one academic year of graduate study.

Application forms are available from the Graduate School, 210 Jesse Hall, Columbia, Mo. and must be submitted by March 1.

Gus T. Ridgel Fellowship for Minority Americans is available for two years for students pursuing a master's degree and four years for those pursuing the doctoral degree. Preference will be given to:

- Black non-Hispanic Americans
- Hispanic Americans
- Native American/Alaskan Native Americans

Students currently enrolled in graduate programs or post-baccalaureate classes are ineligible. Ridgel fellows are selected on a competitive basis. Applicants should have excellent credentials. Ridgel fellows also must fulfill the requirements established by their respective departments in order to ensure the continuation of the fellowship and to remain in good standing in the program. Fellows receive a stipend of $12,000, payment of residential educational fees and waiver of out-of-state tuition, a package valued at $16,000. Candidates for the fellowship must be admitted into and nominated by the department or area graduate program. The chairman, chairwoman or director of graduate studies must provide a letter of nomination that indicates clearly the strengths of the candidate and their potential for success in the program. Nominations must be received in the Graduate School by March 1.

DEPARTMENTAL FELLOWSHIPS AND SCHOLARSHIPS: Departments administer many fellowships, scholarships, prizes, traineeships and other financial assistance for graduate students. Any graduate student receiving a fellowship over $500, which does not include payment of the non-resident tuition, will receive a waiver of the non-resident tuition during the award period. For information concerning these programs, write directly to the department chairman, chairwoman or director of graduate studies.

ASSISTANTSHIPS Approximately 1,200 graduate teaching and research assistantships in various departments and areas are available. Stipends for half-time, nine-month appointments start at $6,000.

A graduate assistant, normally on half-time appointment, may take a maximum of 12 semester hours. Holders of at least quarter-time graduate teaching or research assistantships are required to pay student activity fees; however, they are exempt from out-of-state tuition and resident educational fees.

Applications for assistantships and fellowships are made directly to the chairman, chairwoman or director of graduate studies in the department or area in which the student intends to work.

Information concerning positions as dormitory resident assistants is available from the Residential Life Office, 125 Jesse Hall, Columbia, Mo. 65211.

CURATORS GRANT-IN-AID AWARDS TO INTERNATIONAL GRADUATE STUDENTS are limited in number and are open to campus-wide competition. The grant-in-aid awards are equal to the amount of nine hours of the incidental fee for one academic year. Application forms and detailed information are available from the coordinator of International Student Programs, A02 Brady Commons. To be considered for the fall semester, an application must be received by March 15.

U.S. DEPARTMENT OF EDUCATION: Dial toll-free (800)333-INFO (4636) to access the Student Aid Information Center for information about the Jacob K. Javitts Fellows Program, Minority Participation in Graduate Education, the Ronald E. McNair Post-Baccalaureate Achievement Program, the Patricia Roberts Harris Fellowship Program for graduate and professional study and for public service education, Graduate Assistance in Areas of National Need, Law School Clinical Experience Program and Legal Training for the Disadvantaged (CLEO).

GENERAL PROCEDURES

The academic departments and the Graduate School offer significant fellowship and assistantship support, and fee waivers for outstanding graduate students.

Applications

For an Application for Admission to Graduate School turn to Page 5, or write the Director of Admissions, 130 Jesse Hall, Columbia, Mo. 65211, for admission forms. Transcripts, Graduate Record Examination (GRE) and the Test of English as a Foreign Language (TOEFL) (if required) results must be returned to Admissions four weeks before graduate work is expected to begin.

All graduate students are required to submit the general test scores of the GRE, except students requesting admission to departments that require, in place of the GRE, the Miller Analogy Test, the Terman Concept Mastery Test, or the Graduate Management Admission Test (GMAT). With permission from the dean of the Graduate School, a student may be admitted without test scores if the appropriate examination is taken during the first semester. **The student may enroll in a second semester only if the required test scores are on file in the Graduate School.**

The GRE is given in October, December, January, February, April and June throughout the United States (including Columbia) and in many international countries. Apply for the GRE at least six months before graduate study is to begin.

For further information write to the Educational Testing Service, Princeton, N.J. 08540.

INTERNATIONAL STUDENTS: For information and forms concerning admission and estimated expenses, prospective students who are not citizens or permanent residents of the United States should write the Office of International Admissions, 123 Jesse Hall, Columbia, Mo. 65211, at least one year before the date of desired admission.

Students from countries where English is not the native language must take the TOEFL given by the Educational Testing Service, Princeton, N.J. 08540. The test should be taken six to nine months before the opening session in which the student expects to enroll.

APPLICATION DEADLINES: An application for admission and all transcripts must be on file no later than July 1 for graduate students who enter the fall semester, December 1 for the winter semester and May 1 for the summer session. Many departments establish earlier deadlines, especially when financial assistance decisions must be made. Write or call the department director of graduate studies for specific deadline dates.

Admissions

General admission and degree requirements for the Graduate School are determined by the graduate faculty through its representatives on the Graduate Faculty Senate. However, admission to the Graduate School does not in itself entitle a student to candidacy for an advanced degree. A student must also be accepted for advisement by the faculty of a department or area. Departments and areas establish admission standards that, in many cases, exceed the minimum requirements of the Graduate School.

ADMISSION TO THE GRADUATE SCHOOL is based on three considerations:

- proof that the applicant has earned a baccalaureate, DVM, MD or JD degree equivalent to that granted by MU
- a grade point average (GPA) of B or better in the last 60 hours of undergraduate education
- official results of the GRE

ACCEPTANCE BY DEPARTMENT OR AREA: The student must obtain departmental or area acceptance for advisement before beginning work toward the degree. Acceptance standards are determined by the department, but in general are based on previous academic record, scores on the GRE or a comparable test and letters of recommendation.

Consult individual departments or areas for information on their special requirements for accepting a student for advisement. The departments and areas are listed alphabetically in the courses section of the catalog.

Special Enrollment Categories

POST-BACCALAUREATE SPECIAL STUDENTS: The Post-Baccalaureate Special 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, or to take courses for career advancement, or simply to seek personal enrichment experiences. A PBS student has access to MU libraries, laboratories, museums, and recreational and athletic facilities, and may interact with students in degree programs and with members of the MU faculty.

The PBS student who wants to earn a graduate degree must submit official scores on an appropriate graduate admission examination (GRE, GMAT, MAT), be accepted for advisement in a degree-granting program or area, and meet Graduate School admission requirements. At the discretion of a department or area, the graduate-level courses completed while a PBS student with a grade of B or better may be applied toward a graduate degree in that department or Area. Of the courses listed on a degree program, no more than 12 semester-credit hours may have been completed while enrolled as a PBS student.

The Post-Baccalaureate Special Student Program is administered by the Graduate School. The PBS student may take graduate-level courses, but is not classified a graduate student and does not earn credit toward a graduate degree.

Applicants who hold a baccalaureate degree, or its equivalent from a US university or a university in which instruction is in the English language may be admitted to MU as PBS students by the Graduate Dean. International students who do not satisfy this requirement and are seeking admission as PBS students must provide evidence of proficiency in English. Either a score of 530 (minimum) on the Text 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 an English-speaking college or university is required.

Applicants must submit the MU graduate application and pay the application fee.

The PBS student is required to pay graduate tuition or educational fees and graduate student activity fees.

Financial Aid through the Graduate School is not available to the PBS student. These students do not qualify for waivers of tuition or of the educaitonal fee that are funded by the University.

SENIOR DUAL ENROLLMENT: With the approval of the divisional and graduate dean, last semester seniors who rank in the upper half of their classes, 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 and 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 is also available to seniors in other Missouri colleges. Additional information may be obtained from the Graduate School.

UM TRAVELING SCHOLARS PROGRAM is designed to provide breadth and depth in the opportunities for graduate study offered at the four campuses in the University of Missouri System by permitting advanced graduate students at any one of the campuses to enroll in courses that are not available on their home campus. 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 an MU Traveling Scholar cannot be used to satisfy the masters degree residency requirement. The student's adviser initiates the proposal for the student's enrollment in a given course by contacting the appropriate professor at the campus where the student wishes to study. The concurrence of the respective graduate deans is required. When participating in the program, the student will register for the appropriate number of hours and pay fees at the home campus.

Registration Procedures

REGISTRATION FORMS: New students who qualify for admission and who have paid an admission fee are issued an enrollment card at the Graduate School office. Enrollment cards for each fall and winter are made automatically for all students enrolled at MU. Enrollment cards for each summer session also are made automatically for graduate students enrolled for the winter semester or for the previous summer session.

PREREGISTRATION: Enrolled students may complete registration for the upcoming semester during preregistration in October and April. New students may preregister for the fall semester in June and 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 January 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 chairman 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.***

PETITIONING: The student's adviser and the graduate dean must approve a petition to withdraw from one course or enter another during a semester. Petition forms and instructions are available in the Graduate School. Only under extenuating circumstances may a student enter a course after six class meetings.

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 withdraws from a course on or after the 26th day and who is doing failing work is assigned the grade WF. If the quality of the student's work is not judged to be failing at the time of withdrawal, the instructor may assign a grade of W. Current regulations and time schedules for petitioning, withdrawing or changing status of enrollment are included in the Schedule of Courses each semester or session.

ENROLLMENT REQUIREMENTS AND RESTRICTIONS: Students working toward advanced degrees are required to enroll in the Graduate School not only for courses that are part of the advanced degree program but also for undergraduate courses that carry no graduate credit and for courses that a graduate student may be taking 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.

Unless special permission of the graduate dean is secured, the maximum credit hours in Graduate School is 16 each semester or 9 for the summer session.

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 degree candidates who have completed all requirements but the final examination and the thesis (if required), must be enrolled in the Graduate School when the final examination is given or the thesis read. Such students must enroll for examination only and pay a fee of $89.90. Students who enroll under this rule are not entitled to Student Health Service benefits.

WITHDRAWAL: Formal withdrawal from MU is arranged through 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 WF 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 dean 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 zero-credit courses are required to pay fees according to the number of hours of instruction.

Academic Honesty and Professional Ethics

Academic honesty is essential to the intellectual life of the University. Anyone who passes off as his or her own the answers, words, ideas, or research findings of another person is 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 department chairperson 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 should also be aware of the fact 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.

Termination

In addition to dismissal for failure to meet the usual examination and grade requirements, departments and graduate-degree-granting areas 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, department chairman or chairwoman must inform the graduate dean 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.

A student may initiate an appeal of this dismissal through the graduate dean. A description of the appeal procedures may be obtained from the Graduate School, 210 Jesse Hall.

MU's Graduate School enrolls over 5,000 graduate students.

Grading and Scholastic Requirements

Graduate student's 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 WF denotes withdrawn failing. An incomplete grade (I) may be recorded when the student's work is incomplete but otherwise worthy of credit or when the instructor feels 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 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 courses at the 300 level. Courses at the 400 level are primarily for graduate students. 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 S/U in graduate-level courses only when the graduate-level course is approved for S/U grading only.

The GPA in the Graduate School 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 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, 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 that the semester or cumulative GPA falls below 2.0.

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

Fees

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

United States Citizen $20

International Students $40

The fee for international students is based on the higher cost of processing these applications. This fee is non-refundable.

EDUCATIONAL FEES AND NON-RESIDENT TUITION

The educational fee of $89.90 a credit hour (1991-92) includes laboratory fees and fees for library privileges. Non-resident tuition is $244 a credit hour (1991-92).

Incidental fees are waived for any graduate student who is a resident of Missouri and a graduate teaching or research assistant on at least a 25 percent full-time equivalent appointment.

Tuition is not charged to any permanent resident, that is any person who has been a resident of Missouri for at least one year prior to registration. Student status does not apply toward this residency requirement.

Tuition is waived for any non-resident graduate student who is a graduate teaching or research assistant on at least a 25 percent full-time equivalent appointment and for any non-resident graduate student holding a fellowship which does not include payment of tuition. Prospective graduate students may contact the Graduate School or the cashier to determine the fees.

A student who is full-time staff at MU or is the unmarried minor child or the spouse of such a staff member does not pay tuition but will be charged the incidental fee.

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

For details see Tuition and Residence Rules available from Admissions, 130 Jesse Hall, or refer to rule 7.06303 of the Collected Rules and Regulations of the University.

STUDENT ACTIVITIES FEE: Students registered for resident work on campus are required to pay a student activities fee of $6.25 a credit hour (1991-92), with a maximum of $75 during regular semesters and $37.50 in the summer session.

This $75 student activities fee is allocated to the following Memorial Union/Brady Commons, $18.50; Warren E. Hearnes Multipurpose Building bond retirement, $4; Student Government, $11; Student Organizations, $3; Divisional Student Council Programs, $2; Student Fee Capital Improvements, $4; Associated Students of the University, $2; Intramural Program, $3; Transportation, $7.50 and Student Recreation Facility, $20.

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.

HOUSING: Contact the Department of Residential Life at 125 Jesse Hall for information about residence halls and student apartment rates and availability. Missouri residents please feel free to use the toll-free number (800)225-6075 for housing information.

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 on this page. For any session other than these, the refund will be calculated in the same way. Deductions may be made from the refund for any money students owe the University.

LATE REGISTRATION FEES are charged if students do not complete registration by the last day of regular registration.

SUPPLEMENTAL FEES

University Parking Regulations: Parking permits are required for all campus parking lots and may be purchased at Parking and Transportation Services Student Office, 128 Brady Commons.

Residential Life Parking: Limited parking is available to residence hall students wishing to park adjacent to their units. Application should be made to Parking and Transportation Services Student Office, 128 Brady Commons. Further information about parking regulations may be obtained at Parking and Transportation Services, 107 Swallow Hall or 128 Brady Commons.

Bicycle Regulations: All bicycles must be registered with the city. Information about campus bicycle regulations is available at Parking and Transportation Services, 107 Swallow Hall or 128 Brady Commons.

Hood Fee: Those granted PhD or EdD degrees may purchase hoods for a $25 fee.

Diplomas held for delinquent indebtedness: A student is required to clear all delinquent indebtedness to the University before a diploma may be released or 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 department chairman or chairwoman.

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 pre-register 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.

Following are methods of fee payments that may be arranged:

1. Full payment during period due.
2. Installment fee payment which results in an additional administrative fee.
3. Written authorization to cashiers to hold registration on basis of financial aid.

Contact the Cashier's Office, Jesse Hall, for information on the above methods of fee payment.

Personal Checks in 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 from the student. A service charge of $10 will be assessed on each check returned unpaid.

A student presenting a check to the University in payment of 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: MasterCard and VISA are acceptable toward payment of fees.

Deferred payment of Incidental Fees: Graduate assistants employed at a level of 0.25 full-time equivalent (FTE) or more, qualify for deferral of the incidental fee. Under this program, a service charge of $15 and the student activity fee are paid at the normal payment deadline date for preregistered students or at regular registration. The incidental fee is paid in three installments on dates specified by the Graduate School. This plan is not implemented automatically, graduate students must request deferred payment from the Graduate School. Graduate assistants receiving other financial aid are not eligible except on approval of the Financial Aid Office. The plan is not to be implemented for summer sessions, intersessions or other special sessions. For more information contact the Graduate School.

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 graduate programs in Nebraska and be charged at the rate paid by Nebraska resident students. Conversely, qualified resident students may enroll in graduate 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, 130 Jesse Hall.

DEGREES

Master's Degrees

The University confers the master of arts, master of science, master of science for teachers, master of business administration, master of education, master of music, master of fine arts, master of public administration, master of social work, and master of health science degrees. A degree is awarded to the student who satisfies the general requirements of the Graduate School and the special requirements of the degree-granting department or area.

SELECTION OF AN ADVISER AND APPLICATION FOR DEGREE: The student selects a consenting adviser from faculty members of the department or area 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 Application for the Master's Degree, an outline of the course of study for the student's graduate program, and forwards the application through the departmental or area director of graduate studies to the dean of the Graduate School.

Although this form may be revised by a letter from the adviser to the graduate dean, no course, once it has been taken, may ever be removed from the program. The degree application form must be filed no later than the session preceding the semester or session in which the student expects to receive the degree.

Upon approval of the application by the dean of the Graduate School, the student is a candidate for the degree.

COURSE 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 dean. In addition, the minimum 30-hour requirement is subject to the following regulations.

Credit for Minor Study: A student may choose a minor composed of course work selected from one or more departments, providing such course work constitutes a unified program. If selected, a minor must include at least 10 hours of course work approved by an adviser in the minor subject and approved by the student's major adviser, the department chairman, chairwoman or director of graduate studies and the graduate dean.

Independent Study Credit Other Than Correspondence: A maximum of 12 hours of research, problems, special investigations and special readings is permitted.

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 8 hours of correspondence courses which are authorized for graduate credit and offered by MU's faculty through the UM Center for Independent Study at 136 Clark Hall. To apply such courses toward a master's degree, the student must have completed at least one semester or summer session of satisfactory residence work. Exception is made for people in the armed services who receive, in advance of their enrollment in the correspondence course, approval by an adviser and the graduate dean for correspondence work before establishing residence at MU.

Off-Campus Research Credit: Upon recommendation of the student's adviser and approval by the department or area director of graduate studies and the graduate dean, a student may enroll for off-campus research for a total of no more than 8 hours, no more than 4 hours a semester or 3 hours a summer session. To enroll for off-campus research, a student must have been enrolled in the Graduate School at least one summer term on a full-time basis or one semester part-time.

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 department or area director of graduate studies and the dean of the Graduate School. 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 MU or elsewhere may, upon recommendation of the adviser and approval by the department or area director of graduate studies and the graduate dean, present a maximum of eight hours of credit earned in the previous program toward a second master's degree. A student may pursue two master's degrees simultaneously, but not more than eight hours of credit may be applied to both programs.

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 the regulations governing the preparation of theses from the Graduate School and a copy of departmental or area requirements from the department or area director of graduate studies. The following instructions outline the procedure for thesis acceptance:

- the thesis is approved by the major adviser and a second reader from the department or area
- the typewritten thesis is submitted to the dean of the Graduate School on or before the official deadline date preceding expected graduation. Consult the Graduate School for deadline dates.
- the graduate dean appoints a third reader from outside the department or area. The adviser and department or area director of graduate studies may recommend this third reader to the dean of the Graduate School. When the third reader approves the thesis, a final examination may be scheduled.
- if the student's final examination committee recommends that the thesis abstract be included in the thesis, the student prepares an abstract of not more than 150 words for this purpose

The dean of the Graduate School reserves the right to review all masters' theses.

Graduation Requirements

During the first six weeks of the semester in which the program of study outlined in the Application for the Master's Degree is expected to be completed, the candidate must personally confirm with the Graduate School all graduation arrangements.

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 appointed by the dean of 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 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 department or area director of graduate studies to the graduate dean.

Where no thesis is presented by the candidate, the final examination committee is designated by the department or area director of graduate studies with the approval of the graduate dean. Certification of completion of the examinations, signed by the director of graduate studies, is forwarded to the graduate dean. All candidates for the MA or MS degrees must complete either a thesis or a substantial independent project.

The candidate must be enrolled at the University during the semester or session in which completion of the final examination is certified.

The program for the master's degree must be completed within a period of eight years after the first enrollment, not including time spent in the armed services. For any extension of this time limitation, the student must petition the graduate dean. Such petitions must be received in the Graduate School before the expiration of this period and must be approved by the adviser, the departmental or area director of graduate studies and the graduate dean.

For academic advice or assistance with degree program planning, students should contact the director of graduate studies of their major departments or areas or the dean of the Graduate School.

SPECIAL REGULATIONS: In addition to the general regulations above, which govern all masters' degrees, special Graduate School rules, summarized below, apply to each of the following masters' degrees.

MU's Library and its six branches serve the entire University community with a collection of more than 2.4 million volumes and more than 19,000 subscriptions to magazines and journals.

The master of arts degree represents the successful completion of a unified program of course work designed to provide a high level of broad competence in a discipline. Thirty hours of graduate credit, including at least 15 hours in 400-level courses, are required. Depending upon department requirements, the thesis is optional.

The master of science degree is oriented toward research, and normally a thesis or research paper is required. The program must include 30 hours of graduate credit, with at least 15 hours of these being in 400-level courses.

Master of Arts and Master of Science Degree Requirements All candidates for the master of art and master of science degrees are required to complete a substantial independent effort, reflecting some measure of creativity and originality and to produce evidence of such effort. This evidence may be in the form of a thesis, an original composition or design, a publishable manuscript, an artistic performance, a creative writing or translation, an essay of publishable quality or any other expression of independent effort determined to be appropriate by the department in which the student seeks advisement. Academic credit allowed for this portion of a student's program shall not be less than three or more than 12 credit hours.

There must be a statement of the project or thesis on file in the Graduate School. This statement must be signed by the advisory committee and approved by the dean of the Graduate School. The graduate dean reserves the right to review the final product or thesis. No MA or MS will be granted without fulfillment of this requirement.

The master of accountancy degree is a one-year program of advanced professional study in accountancy. 1991 marks the fifth year of the professional accountancy program, which provides a better foundation for the practice of professional accounting. Study in the environment of accountancy, advanced financial accounting theory and more in-depth areas of specialization are offered. A specialization in taxation is available.

The master of arts in physical education degree represents advanced study in physical education with a special focus in the area of human performance, including exercise physiology. The program requires 30 semester hours of graduate work, including a thesis, and prepares graduates for careers in fitness, wellness and rehabilitation.

The master of business administration degree provides professional training in finance, management and marketing for persons preparing for careers in business. Total graduate course work necessary may vary from 39 to 63 semester hours, depending upon the nature and quality of a student's undergraduate preparation.

The master of education degree, as distinguished from the master of arts in education degree, does not emphasize the conduct of research. Designed to prepare professional educators at a broad level of competence, it requires a minimum of 32 semester hours of graduate courses including 16 hours of 400-level courses. Students must pass a final comprehensive examination. Refer to the Education section for more information.

The master of fine arts, the terminal degree in the field, provides superior preparation for those planning to work professionally as visual artists or as teachers of visual art at the college level. Of the 60 credit hours required for the degree, 54 hours are in studio art courses, and six hours are in art history courses. Art history courses must be at the 200 level or above. At least 30 hours of the studio art courses must be at the 400 level. Students shall select two major areas of concentration in studio art (such as painting and drawing) for a total of 30 hours and minor field for nine hours. The remaining 15 hours in studio courses may be chosen from studio subjects other than those of the major and minor areas and must include Art 404: MFA Thesis Exhibition Documentation. A minimum residence of two years is required, at the conclusion of which degree candidates shall prepare and present an exhibition of their work with documentation and pass an oral examination on the art works in the exhibition.

The master of health administration degree prepares professionals for leadership roles in health administration. The curriculum includes 15 hours of foundation coursework, 45 hours of Health Services Management coursework, and 6 hours of professional electives, all of which cover the competency areas of quantitative analysis, financial management, health planning and marketing, organization and management, and health system organization and development. Dual degree options include MHA/MBA, MHA/MPA, and MHA/MSIE.

The master of health sciences degree is granted for work in speech-language pathology through the program in communicative disorders. Each student in the training program for the professional master's degree must complete, at the undergraduate or graduate level, at MU or elsewhere, the requirements for an undergraduate major in communicative disorders. Candidates for the MHS degree must also complete a minimum of 36 semester hours of advanced course work including at least 24 hours of advanced study offered by the University faculty. The degree is clinically oriented. However, there is a thesis option for those students interested in research or further study toward the doctor of philosophy degree.

The master of music degree, which represents an advanced level of achievement in applied music, requires 32 to 34 hours of graduate work, including at least 16 hours in 400-level courses. Majors in performance or conducting must give at least one formal public recital. Majors in theory must satisfactorily complete a thesis on an approved topic. Composition majors must complete a substantial compositional project.

The master of public administration degree offers professional education for individuals preparing for positions of leadership in the public service with local, state and national governments, other government agencies and the not-for-profit sector. The degree consists of up to 39 hours of graduate courses and a summer internship for those without significant work experience. The MPA program is offered in the evening in Columbia or in Jefferson City.

The master of science (physical sciences) 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. 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. Math 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, Math 201, or its equivalent, must be included in the program for the degree.

The master of science for teachers is designed to strengthen the subject matter competence of high school teachers in those sciences commonly taught in the nation's high schools. It is not intended to qualify the recipient for a junior college or college teaching position, nor to count as a full year's work toward the doctoral degree. At least 24 semester hours of acceptable credit in college-level sciences and a teaching certificate are required for admission to the program. This degree is offered in the areas of mathematics, economics and physical science (physics). It requires 30 hours of graduate work, including one 400-level course in the area. Only subject matter courses can be used to satisfy the requirement, although the program is quite flexible in order to meet the needs of individual students.

The master of social work degree provides a beginning leadership competence in professional social work practice. The MSW degree requires 60 hours of graduate work, except for holders of the BSW from an accredited school, who, if accepted for admission to the graduate program, may complete the MSW requirements in 37 credit hours.

Dual Degrees: Several schools and departments have formal agreements, on file in the Graduate School, to award dual masters' degrees simultaneously. Each master's degree must meet the requirement of 30 hours beyond the bachelor's degree in courses at the 200 level. The requirements for each dual master's degree are detailed under the participating programs in Fields of Study.

Dual-Degrees for Medical Students: Using the flexibility of the graduate and medical curriculum, students may pursue combined MS/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 program enables students to complete PhD degrees in microbiology, anatomy, pathology, physiology, biochemistry, nutrition and pharmacology.

Financial support may be provided for all of the graduate and some of the medical portions of the dual-degree program.

The MD/PhD is a six- to eight-year program for the student seeking a biomedical research career. The time is dependent upon the dissertation research project and its successful completion. The traditional sequence is two years of medical course work followed by graduate courses and research to the completion of the dissertation and return to medicine to complete the medical curriculum. The MD and PhD degrees are awarded simultaneously at the completion of the total program.

Opportunity for work on an MD/MS program also is available with the master's degree awarded in several disciplines. Inquires should be directed to the dean's office, School of Medicine.

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 dean. A maximum of six semester hours may be accepted in transfer from institutions accredited to offer post-master's 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. Refer to the Education section 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 the special requirements of the department or area awarding the degree. 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.

The doctoral student must be admitted to the Graduate School and accepted for advisement in a department or area program. Acceptance is based on the student's previous academic record, scores on the GRE and other tests and letters of recommendation, as prescribed by the department or area program.

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.

APPLICATION FOR DEGREE: By the end of the first year of doctoral work at MU, a student should file a formal application for the degree of doctor of philosophy or doctor of education and request the appointment of a doctoral program committee. Forms are available in the Graduate School. The student's adviser and the departmental director of graduate studies approve the application and request and then submit the forms to the graduate dean.

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

CREDIT-HOUR REQUIREMENT: MU requires a minimum of 72 semester hours beyond the baccalaureate degree for the PhD and a minimum of 82 semester hours beyond the baccalaureate degree for the EdD.

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. The doctoral program committee may recommend that a specific number of hours in a master's degree be credited toward this requirement and that hours be credited for additional graduate work done either at MU or elsewhere. The committee may recommend that extension courses approved for graduate credit and taught by MU faculty be counted toward the credit-hour requirement.

RESIDENCY REQUIREMENT: Within this credit-hour requirement is the residency requirement. In order 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.

DOCTORAL CANDIDACY AND CONTINUOUS ENROLLMENT: Candidacy for a doctoral degree is established by passing the comprehensive examination for the PhD or the matriculation examination for the EdD. Candidacy is maintained by enrolling in 490/491 Research for two semester hours each fall semester, two semester hours each winter semester and one semester hour each summer session. 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 re-established by payment of the registration fees owed and completing the requirements specified by the student's doctoral program committee. Registration fees owed will not exceed the amount owed for seven semesters, regardless of the number of semesters 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 re-established 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.

A REASONABLE RATE OF PROGRESS toward the degree is required. Excluding work toward the master's degree or its equivalent, the program for the doctoral degree should be completed within eight calendar years. Before the expiration of the eight-year period, any student requiring additional time must submit a request to the adviser. If the adviser approves the request, a formal request is then made to the graduate dean. An extension, if granted, may entail a revision of the candidate's program to update course work and research.

OFF-CAMPUS RESEARCH: To enroll for off-campus research a student must have completed 32 semester hours of acceptable graduate work. Credit for off-campus research work for doctor of education candidates is limited to three semester hours during a given semester and a total of six semester hours.

PhD DEGREE REGULATIONS

The Doctoral Program Committee must be recommended by the student's adviser and appointed by the graduate dean before one year has elapsed following the student's first registration for courses to be included in the doctoral plan of study.

The Doctoral Program Committee shall consist of a minimum of five faculty, at least three from the doctoral program in which the student is taking the degree, and at least one from another MU doctoral program.

The Graduate School is a member of the Association of Graduate Schools and the Council of Graduate Schools.

All members of the Doctoral Program Committee will be intimately involved and will actively participate in the varied activities of the doctoral student at all the stages of the student's career at MU except the qualifying examination, and, depending on the department's or area program's procedures for assessing a student's background and prospects for success in the department's doctoral program, the committee may participate in this function as well. Any member of the committee may call a meeting of the full committee at any time to update student 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 Graduate School
- 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 fifteen hours of course work at the 400 level (exclusive or 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; 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 dean, satisfy the language or special research skill requirements of the department, and complete the residency requirement (see Credit-Hour and Residency Requirement) before being declared ready for the comprehensive examination.

Comprehensive Examination: One month before the comprehensive examination begins, the committee reports the readiness of the student to undertake the examination.

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 in one month. The written segment of the comprehensive examination is arranged and supervised by the major adviser. It consists of written questions prepared and graded by the doctoral program committee. For the comprehensive examination to be successfully completed, the committee must vote to pass the student with no more than one dissenting or abstaining vote. A report of this examination, carrying the signatures of all members of the committee must be sent to the graduate dean not less than two weeks after the comprehensive examination is terminated. If failure is reported, the committee recommends remedial measures.

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

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 from the Graduate School guidelines governing the preparation of dissertations and should consult the director of graduate studies for departmental style requirements.

Three members of the doctoral program committee (the dissertation supervisor, a second reader from the student's major department and the outside member of the committee) affirm that the dissertation is ready for defense and submit the dissertation to the graduate dean on or before the official deadline date preceding the anticipated date of graduation. The remaining members of the committee review the dissertation and participate in the final dissertation examination.

The dissertation must be submitted in a form suitable for binding and microfilming. The dissertation must be accompanied by a brief title of no more than 50 letters and spaces, an abstract of not more than 350 words and a brief biographical sketch in paragraph form. The typescript must include suitable acknowledgement that it is a dissertation submitted to the graduate faculty of MU in partial fulfillment of the requirements for the degree of doctor of philosophy or doctor of education.

Upon approval of the format of the dissertation typescript, the graduate dean sanctions the final dissertation examination, which shall be open to the general faculty. The candidate must be enrolled to take this examination, which is not administered when MU is not officially in session. A report of the examination, carrying the signatures of all members of the committee, is sent to the graduate dean before the deadline preceding the anticipated date of graduation.

EdD DEGREE REGULATIONS

A minimum of 82 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 accepted for advisement, the student must have attained the degree of master of arts with a major in education or 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 of the graduate dean a doctoral program 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 study program.

If required, the qualifying examination must be successfully completed before the study program is determined by the adviser and the student in cooperation with the doctoral program 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.

Matriculation 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 program committee.

When the doctoral program committee determines that the needed course work has been completed with satisfactory grades, it plans the matriculation examination (a written and oral comprehensive 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 the final oral examination. If not otherwise enrolled for courses on campus, the student must be enrolled for "examination only" during the semester or session in which the examination is taken.

For the matriculation examination to be completed successfully, the committee must vote to pass the student with no more than one dissenting or abstaining vote. If failure is reported, the committee recommends suggested work or remedial measures.

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

The Dissertation, for which not less than eight semester credit hours may be granted, has no maximum credit restriction, providing that more than 70 graduate hours of other approved courses are completed and granted toward the doctor of education degree. The dissertation must be reviewed and approved by the doctoral program committee.

In addition, the doctoral program committee, including the adviser, conducts a final oral examination on the work included in the dissertation. The candidate must be enrolled for this examination, that must be completed when MU is officially in session.

Accountancy

College of Business and Public Administration
312 Middlebush (314)882-4463

FACULTY

Raymond C. Dockweiler, director, associate professor, PhD, CPA, University of Illinois
James C. Stallman, director of graduate studies, professor, PhD, University of Illinois
Loren A. Nikolai, professor, CPA, PhD, University of Minnesota
James E. Parker, professor, CPA, PhD, Michigan State University
Charles Litecky, associate professor, PhD, University of Minnesota
Earl R. Wilson, associate professor, CPA, PhD, University of Missouri-Columbia
Kenneth E. Dimitry, assistant professor, CPA, PhD, Florida State University
Kathleen J. Fiederlein, assistant professor, CPA, PhD, Indiana University
Inder Khwana, assistant professor, PhD, Arizona State University
Carol M. Lawrence, assistant professor, PhD, Indiana University
Robin W. Roberts, assistant professor, CPA, PhD, University of Arkansas
Jenice P. Stewart, assistant professor, CPA, PhD, University of Alabama

DEGREES: M Acc, MS and PhD in accountancy

The School of Accountancy offers graduate work leading to the master of accountancy, master of science 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 offers course work stressing advanced knowledge in accounting theory, data processing, 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 our 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 March 1.

For additional information, including an individually prepared tentative program of study and application forms, write the director of graduate studies, Jim Stallman, 312 Middlebush Hall, School of Accountancy, Columbia, Mo. 65211.

MASTER'S DEGREES: The school offers two master's degree programs. The master of accountancy (M Acc) program is designed for students who have an undergraduate degree in accountancy. The master of science (MS) program services qualified students with a baccalaureate degree in a field other than accountancy.

To be accepted for advisement in either program a candidate must:

- have a 3.0 (A=4.0) or higher GPA in the last 60 semester hours of the undergraduate curriculum. Additional consideration is given to grade trends, performance in the student's major area, class rank, maturity, experience and other factors bearing on a student's probable success in advanced professional study.
- present a 75th percentile or higher score on the Graduate Management Admissions Test (GMAT) or on the GRE. In some situations a higher GMAT score will offset a lower GPA and vice versa.

THE MASTER OF ACCOUNTANCY is a one-year program of advanced professional study, covering the environment of accountancy, advanced accountancy and accountancy practice fields. 1991 is the fifth year of the professional accountancy program. A limited amount of specialization is permitted to meet individual career objectives of students.

For the M Acc degree, a candidate must complete substantially all course requirements for the accountancy undergraduate degree at MU or their equivalent. A maximum of six semester hours of graduate-level course work can be completed while dually enrolled for undergraduate course work or transferred from another accredited master's program. The candidate must maintain a GPA of 3.0 (B) or better while completing a minimum of 30 hours of graduate course work approved by the program director. At least 20 hours of credit must be earned in courses reserved exclusively for graduate students, 15 of which must be in accountancy. Six or more hours of credit must be earned in courses from outside the School of Accountancy.

MASTER OF SCIENCE IN ACCOUNTANCY is a four-semester professional program. The MS degree is built around a core of accelerated courses inaugurated specifically for the mature student. In addition to accountancy courses, the curriculum covers economics, electronic data processing, law, business and public administration (organization, functions, problems), mathematics and statistics.

The first year of study consists of foundation courses to provide basic concepts, techniques and analytical thought processes for the advanced study of accounting. One or more of these foundation courses may be waived for students whose undergraduate records indicate that they have already successfully mastered the equivalent subject matter.

Second-year courses cover the advanced educational requirements of the professional accountant or accounting-oriented business manager. They stress the theory and practice of accounting and give balanced consideration to the various accounting areas in relationship to the organization, functions and problems of business and public administration.

To complete requirements for the MS degree, a student must complete the professional program of study with an average grade of B or better. At least 30 hours credit must be earned in courses reserved exclusively for graduate students, 15 of which must be in accountancy.

DOCTORAL DEGREE: In order to be considered for acceptance into the school's doctoral program, a candidate must:

- have a 3.0 or higher GPA in the last 60 hours of the undergraduate curriculum. Additional consideration is given to class rank, grade trends, experience, maturity and other factors bearing upon probable success in the program.
- have above a 3.0 GPA in at least 30 hours of graduate work
- show superior performance on the GRE or the GMAT. Superior performance is anticipated at approximately the 90th percentile, although in some situations a higher GMAT score will offset a lower GPA and vice versa.

To be admitted, a student must complete the equivalent of the master of accountancy and demonstrate competency in financial accounting and auditing, cost and managerial accounting, data processing, taxation and governmental accounting. Course work equivalent to the master's degree may be transferred from another institution. Competency is demonstrated by a written or oral qualifying examination conducted by an advisory committee. The qualifying examination is given once each year, early in the fall semester, and is used, together with other credentials, by the student's advisory committee to determine the course of study.

The doctoral degree in accountancy requires at least two years beyond the master's degree and consists of:

- a course of study
- practical experience in teaching and research
- a comprehensive examination over accumulated knowledge in a major and two supporting fields
- demonstrating research and writing ability by completing a doctoral dissertation on an approved research topic

At the discretion of the advisory committee, up to 36 hours, completed in a master's program, or its equivalent, may be included in a student's course of study, which is composed of the following categories (all hours are minimums): accountancy, the primary field, 24 hours; research techniques, 12 hours; first supporting field, 12 hours; second supporting field, 12 hours; elective area, six hours.

Supporting fields are selected from behavioral science, data processing, economics, finance, management, marketing, organization theory, public administration, quantitative methods or other definable areas related to the accounting research area of interest to the student and acceptable to the advisory committee. One supporting field must be from outside the College of Business and Public Administration.

COURSES

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

236—Financial Accounting I (3). Concepts and procedures of measurement and disclosure of accounting information in published financial statements. Prerequisite: 37.

246—Financial Accounting II (3). Continuation of 236. Prerequisite: 137GH or 236.

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

268—Accounting Information Systems (3). Methods of processing accounting information systems with emphasis on intermediate computing skills and controls. Prerequisite: 258.

273—Introduction to Taxation (3). Survey of history and structure of various types of taxes that affect taxable entities, with emphasis on federal income tax. Prerequisite: 37 or 137GH.

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

316—Accounting Principles I (3). Fundamental accounting principles and techniques; emphasizes financial accounting. Prerequisite: MS in accountancy candidate or graduate standing, with departmental consent.

317—Accounting Principles II (3). Continuation of 316, with emphasis on managerial accounting principles and techniques. Prerequisite: 316.

325—Governmental Accounting and Budgeting (3). Principles of fund accounting, financial reporting and budgetary control in nonprofit organizations; program-planning-budgeting systems; governmental and institutional auditing; special problems. Prerequisite: 236 or instructor's consent.

336—Advanced Financial Accounting (3). Study of business combinations, consolidated statements, partnerships, foreign exchange and other financial accounting topics. Prerequisite: 246.

337—Cost and Managerial Accounting II (3). Accounting and other measurement and communication techniques applied to management problems of analysis, planning and control. Prerequisite: 237 or departmental consent.

344—Auditing (3). Social role of auditing; fundamentals of contemporary auditing theory and practice with emphasis on planning, collection and evaluation of audit evidence and reports. Prerequisite: 15 hours of accountancy including 246 and 268, or instructor's consent.

358—Systems Analysis and Design in Accounting (3). Problems of installing and managing computer systems; impact of computer on decision-making functions and simulation models; evaluation of recent developments; case studies. Prerequisite: 258.

364—EDP and Statistical Auditing (3). Theory and practice of utilizing EDP and statistical techniques for various phases of internal and external audit engagements. Prerequisite: 344.

373—Intermediate Taxation (3). Topical coverage of tax problems for partnerships and corporations; emphasis on corporate and business-related topics. Prerequisite: 273.

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

403—Controllership (3). Cost accounting systems and the role of the controller in providing meaningful information to management. Open to MS in accountancy students and other graduate students with director's consent. Prerequisites: 37, and 137 or 317.

406—Advanced Accounting Practice (3). Study of business combinations, consolidated statements, partnerships, foreign exchange and other financial accounting topics. Prerequisites: 317, open to MS in accountancy students and other graduate students with departmental consent.

407—Tax Theory and Practice (3). Survey of various taxes with emphasis on federal income tax of individuals and business entities. Open to MS in accountancy students and other graduate students with director's consent. Prerequisite: 317 or equivalent.

408—Accounting Information Systems Theories and Concepts (3). Theories and concepts in accounting information systems with emphasis on expanding analytical and communicative skills. Prerequisite: 268 or instructor's consent.

409—Auditing Theory and Practice (3). Focuses upon contemporary auditing, its essential processes, its role in society and auditors' attitudes and techniques. Prerequisites: 403 and 404; open to MS in accountancy students and other graduate students with the departmental consent.

423—Tax Research and Planning (3). Introduction to tax research; tax impacts on business decisions of business entities. Prerequisite: six hours of tax course work.

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. Prerequisite: 325 or instructor's consent.

428—Advanced Business Programming (3). Applications development in information systems with software engineering. Prerequisite: 268.

436—Financial Accounting Theory I (3). Concepts and theory of current financial accounting practice. Prerequisite: 246.

437—Advanced Cost and Managerial Accounting (3). Development and application of current concepts in cost accounting; role of cost accounting in the organization and relationships with financial accounting. Prerequisite: 337.

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. Prerequisite: 344 or 409.

446—Application of Financial Accounting Pronouncements (3). Development, content and application of authoritative pronouncements in financial accounting. Problems and case studies. Prerequisite: 336.

450—Accounting Policy (3). Study of issues affecting the accountancy profession and the professional accountant. Prerequisite: 12 hours of graduate professional accountancy requirements.

453—Seminar in Tax Practice (3). Areas of current interest in tax practice. Prerequisite: 12 hours of tax course work.

455—Seminar in Governmental Auditing (3). Topics related to external and internal auditing of governmental organizations and programs. Prerequisites: 344 and 425, or instructor's consent.

460—Research Methods in Accounting (3). Principles for planning, conducting and reporting research projects in accounting. Each student prepares a research proposal. Prerequisite: 24 hours of graduate study.

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: 436.

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

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

491—Research in Accounting (cr. arr.). Each student is under direction and guidance of an accountancy professor in writing a dissertation. Periodic seminars discuss research projects.

Agricultural Economics

College of Agriculture, Food and Natural Resources
200 Mumford Hall (314)882-3545

FACULTY

Brady J. Deaton, chairman, professor, PhD, University of Wisconsin

Melvin G. Blase, professor, PhD, Iowa State University

Jon A. Brandt, director of graduate studies, professor, PhD, University of California-Davis

Curtis H. Braschler, professor, PhD, Purdue University

Maury E. Bredahl, professor, PhD, University of Minnesota

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

Michael L. Cook, professor, PhD, University of Wisconsin

Charles L. Cramer, professor, PhD, University of Missouri-Columbia

Gary T. Devino, professor, PhD, Pennsylvania State University

Norlin Hein, professor, PhD, University of Minnesota

Stephen F. Matthews, professor, PhD, JD, University of Missouri-Columbia

Donald D. Osburn, professor, PhD, North Carolina State University

Anthony Prato, professor, PhD, University of California-Berkeley

V. James Rhodes, professor, PhD, Harvard University

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

Philip F. Warnken, professor, PhD, Michigan State University

Jerry G. West, professor, PhD, Michigan State University

Abner W. Womack, professor, PhD, University of Minnesota

Francis P. McCamley, associate professor, PhD, Iowa State University

Ronald L. Plain, associate professor, PhD, Oklahoma State University

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

Nicholas Kalaitzandonakes, assistant professor, PhD, University of Florida

Michael S. Kaylen, assistant professor, PhD, Purdue University

Michael J. Monson, assistant professor, PhD, University of Florida

Kevin C. Moore, assistant professor, PhD, Iowa State University

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

Dennis DiPietre, extension assistant professor, PhD, Iowa State University

Donald L. Van Dyne, research associate professor, PhD, University of Maryland

Kenneth W. Bailey, research assistant professor, PhD, University of Minnesota

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 the 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 in the form of fellowships and assistantships for research and teaching. Reasons for supporting a student with a GPA below 3.25 must be documented in detail. Support for research is available from the Agricultural Experiment Station and other granting agencies. After one semester, the records of graduate students without assistantships are evaluated and financial assistance is considered for those students who show superior performance and promise. ***For further information on financial assistance contact Jon Brandt, Director of Graduate Studies, 215 Mumford Hall, Department of Agricultural Economics, 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 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 macro-economics 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.

Another option open for MS students is an Agribusiness Management program, which requires no thesis, but does include an internship for persons without industry experience. Course requirements for this program include six hours of economics, six hours of mathematics and statistics, nine hours of agricultural economics and 12 hours of business administration.

DOCTORAL DEGREE: Departmental acceptance of the student as a PhD candidate is based upon satisfactory performance on a qualifying examination.

The size, quality and diversity of the faculty permits a broad choice of advisers and research topics. Students may specialize in farm management/production economics, agriculture policy, econometrics and price analysis, marketing and agribusiness, natural resources, international trade or economic development.

The student and the doctoral program committee have considerable latitude in planning a program of study. There is no requirement for language or for total hours, although 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.

The general course requirements of the department consist of a well- balanced selection of courses, including at least five agricultural economics courses at the 400 level, economic courses in micro- and macro-theory at the intermediate and advanced levels, quantitative methods, courses in statistics, introductory mathematical economics and econometrics and a minimum of nine hours of graduate-level course work in an area outside the department and beyond the requirements listed above. Each student must pass examinations in agricultural economics, economic theory and a specialty area.

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 (cr.arr.). Supervised study in a specialized phase of agricultural economics. Prerequisite: introductory course in agricultural economics.

220—General Agricultural Marketing (3). Analysis of farm product marketing systems from industry and firm viewpoint. Prerequisite: 50.

230—Farm Programs (3). Study and analysis of past and present government farm programs affecting the agricultural economy. Prerequisite: 50.

241—Cooperative Business Organizations (3). Cooperative business organizations; importance; principles; economic problems. Organizational procedures. Operational practices. Prerequisite: 220.

251—Agricultural Prices (3). Variations in prices of agricultural products; underlying factors. Prerequisites: Statistics 207 or 250 and Economics 251.

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: 50.

270—Economics of Natural Resource Management (3). Examination of natural resource management and economic welfare. Evaluation of alternative public approaches to solve resource management problems with application to rural and agricultural problems. Prerequisite: Economics 251.

271—International Agricultural Development (3). Examines world food problem; analyzes its causes; economic and non-economic policy alternatives for modernizing agriculture in less-developed countries. Prerequisites: 50 and junior standing.

280—Financing the Farm Business (3). Financial management of farm business. Operational methods of credit institutions serving agriculture. Prerequisites: 50 and Accountancy 37.

291—Livestock Marketing (3). Theory and practice in marketing livestock and livestock products with consideration of both cash and futures markets. Prerequisite: 220.

294—Grain Marketing (3). Theory and applied decision making in marketing grain and grain products with emphasis on both cash and futures markets. Prerequisite: 220.

299—Senior Seminar (1). Lectures and discussions on current topics. Employment opportunities and procedures discussed. Prerequisite: senior standing.

301—Topics in Agricultural Economics (1-6). Topics in agricultural economics, current and new, not currently offered in applied and 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 two hours each. Prerequisites: 10 hours of credit in agricultural economics, including 260 or 261, 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. Prerequisite: 260 or Agriculture 111 or equivalent.

320—Agricultural Business Management (3). Study of the managerial process, including the organization and methods of effective management at various levels in agricultural business firms. Prerequisites: senior standing, 220 and 280 or equivalent.

332—Agricultural Policy (2). Four-week summer session for professional agricultural workers. Governmental policies and programs relating to agriculture with a view to understanding their purposes, effects, problems and prospect of improvement.

333—Agricultural Law (3). Statutes, cases and administrative regulations affecting agriculture. Court systems, contracts, deeds, easements, adverse possession, condemnation, fences, nuisances, irrigation rights, liability for employees, trespassers, dogs, bailments, partnerships, corporations, estate planning and income taxation. Prerequisite: junior standing or instructor's consent.

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 classical theory, limited resources, uncertainty and capital theory. Prerequisite: senior or graduate standing.

386—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.

390—Field Training (cr. arr.). 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 and instructor's consent.

400—Problems (cr. arr.). Supervised study and research in specialized phases of agricultural economics. Prerequisite: instructor's consent.

410—Seminar (1). Lectures and reports on economic problems in agriculture.

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

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: 355, Mathematics 80, 205 or 108, Economics 405 or 451 and Statistics 385 or Economics 472.

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 and Statistics 385 or Economics 472.

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. Prerequisite: 312 or 314.

450—Research (cr. arr.). Independent investigation of ad-

vanced 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.

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 of 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 and a course in econometrics is desirable.

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. Prerequisite: Economics 405 or 451.

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 and Mathematics 80, 205 or 108.

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.

475—Econometrics I (3) (same as Economics 475). Emphasis is on given special estimation problems that 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.

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

490—Research (cr. arr.). Independent investigation of advanced nature, leading to dissertation.

Agricultural Engineering

College of Agriculture, Food and Natural Resources
College of Engineering
215 Agricultural Engineering (314)882-2369

FACULTY

James C. Frisby, chairman, professor, PhD, Iowa State University

Dennis M. Sievers, director of graduate studies, professor, PhD, University of Missouri-Columbia

Neil F. Meador, professor, PhD, Michigan State University

Allen T. Hjelmfelt Jr., professor, PhD, Northwestern University

David E. Baker, associate professor, MS, Illinois State University

H. David Currence, associate professor, PhD, Iowa State University

William G. Hires, associate professor, PhD, University of Missouri-Columbia

Fu-Hung Hsieh, associate professor, PhD, University of Minnesota

Eugene L. Iannotti, associate professor, PhD, University of Maryland

Donald Pfost, associate professor, PhD, Ohio State University

Steven C. Borgelt, assistant professor, PhD, Texas A&M University

Howard Neibling, assistant professor, PhD, Purdue University

Leon G. Schumacher, assistant professor, PhD, Iowa State University

Kenneth A. Sudduth, assistant professor, PhD, University of Illinois

Jinglu Tan, assistant professor, PhD, University of Minnesota

Allen Thompson, assistant professor, PhD, University of Nebraska

DEGREES: MS in agricultural mechanization, MS and PhD in agricultural engineering

The Department of Agricultural Engineering provides quality graduate programs leading to a master of science in agricultural mechanization, master of science in agricultural engineering and doctor of philosophy in agricultural engineering.

Thesis research may be in any of these research areas: bioprocessing, post harvest processing, extrusion processing of foods and feeds, agricultural machinery, soil erosion control, structures and environment, water quality, waste management, electronic sensor/controls and industrial products from agriculture.

Well-equipped research facilities include a water quality and bioprocessing analytical lab, bioprocessing pilot scale lab, pesticide application technology lab, electronics and instrumentation, engine test facility, food engineering, soil physics lab and hydrology lab with rain tower.

Technical assistance with electronics, instrumentation and research equipment construction is available. Microcomputers are available for data acquisition and reduction.

Information resources include a departmental reference room, Ellis Library and a microfiche collection of papers presented at major technical society meetings since 1968.

Research assistantships are available to qualified graduate students. For information write Director of Graduate Studies, Agricultural Engineering, Columbia, Mo. 65211. Application for admission must be made to the Director of Admissions, 130 Jesse Hall, Columbia, Mo. 65211.

MASTER'S DEGREES: Master of science candidates in agricultural engineering (MSAE) must have an undergraduate degree, preferably in engineering, and the following core of courses: 15 hours of engineering math, (above the college algebra level), 10 hours of physics, three hours of statistics, three hours of strength of materials, three hours of electrical circuits, three hours of fluid mechanics, three hours of thermodynamics and five hours of biological science or biochemistry. Core courses may be taken as graduate program supporting course work.

Master of science candidates in agricultural mechanization (MSAM) must have at least 22 hours of undergraduate credit in agricultural mechanization courses upon completion of the MS degree.

A masters student must complete a minimum of 30 hours of graduate work, with at least 15 in 400-level courses. Up to 12 hours may be in research or special problems. A thesis is required of students supported on research assistantships and is optional for others.

DOCTORAL DEGREE: The doctoral program normally requires three years beyond the bachelor's degree, a minimum of 15 hours of 400-level work, excluding problems or research, beyond the BS degree, and the student must demonstrate the ability to carry out independent research by presenting a dissertation embodying the results of original investigation.

Departmental acceptance of the candidate is based upon satisfactory performance on a doctoral qualifying examination — written or oral. The exam shall be given no later than the end of second semester in the student's program. The exam may be given twice. Failure to pass the second exam will result in the student being dismissed from the PhD program. Other requirements for admission are basically the same as those for the MS degree in agricultural engineering. A foreign language is not required.

COURSES

AGRICULTURE

201—Surface Water Management (3). Topics include hydrology; soil erosion predictions; elementary surveying; selection and layout of ponds, terraces and water control structures. Prerequisites: Math 10 and junior standing.

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, Math 10 and junior standing.

210—Advanced Shopwork (2). Primarily for students majoring in agricultural education. Applies shop principles to the design and construction of projects. Prerequisite: 60 or equivalent.

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.

240—Agricultural Equipment and Machinery (3). Operation of agricultural machinery. Selection and management of equipment. Prerequisite: junior standing.

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. Prerequisites: Math 10, junior standing or instructor's consent.

300—Problems (1-5). Supervised independent study at the undergraduate level. Prerequisite: instructor's consent.

301—Topics in Agricultural Mechanization (3). Current and new technical developments in agricultural mechanization. Prerequisites: six hours in agricultural engineering or instructor's consent.

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, 60, 103, 201, 210, 215 and 240; a BS degree in agriculture or instructor's consent.

320—Irrigation and Drainage (3). Soil, water and plant relationships. Selection and layout of irrigation and drainage systems. Prerequisite: 201 or instructor's consent.

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.

338—Rural Real Estate Appraisal (3) (same as Agricultural Economics 338 and Agronomy 338).

360—Microbiology of Anaerobic Ecosystems (3) (same as Animal Science 360). Microbiology of anaerobic degradation of organic matter to short chain acids, methane and carbon dioxide. Prerequisites: Biochemistry 110 or higher, Microbiology 205 or higher or instructor's consent.

363—Mechanization System Management (3). This course is the "capstone" for AE-A courses required of agricultural mechanization students. It includes selection, replacement and cost calculation for machine systems; an introduction to linear programming; and an introduction to expert systems. A comprehensive term paper on an agricultural mechanization system (both written and oral) is required. Prerequisites: 103, 165, 201, 215, and 240 or instructor's consent.

390—Agricultural Mechanization Internship (2-5). Problem course following prior approved internship work experience. Problem selected by internship company representative, faculty problem adviser and student. Supervised by faculty problem adviser and presented in technical report form. Prerequisite: senior standing.

391—Engineering Internship (2-5).

400—Problems (cr. arr.). Supervised individual study at the graduate level.

452—Agricultural Mechanization Systems (3). Review of current literature. Case study of mechanization systems. Computer analysis of management alternatives. Prerequisites: microcomputer programming and graduate standing.

490—Thesis Research (cr. arr.). Independent investigation to be presented as a thesis.

ENGINEERING

203—Environmental Control of Farm Buildings (3). Building design for environmental control. Heat and moisture relationships, ventilation and insulation. Prerequisite: 99.

221—Soil Conservation Engineering (3). Analysis of runoff and erosion from urban and agricultural lands. Design and layout of soil conservation structures. Prerequisites: 5 and Civil Engineering/Mechanical Aerospace Engineering 185.

241—Analysis of Farm Machines (3). Tillage, planting, harvesting and crop handling machinery. Construction, selection and economic requirements of agricultural machines. Prerequisites: Physics 123 and computer programming.

250—Physical Principles for Food Processing (3) (same as Food Science and Nutrition 250). Introduction to basic engineering concepts used to process raw materials. Energy balance. Pipe flow. Viscosity. Heat exchange. Prerequisites: one calculus course and one physics course.

300—Problems (1-5). Problems assigned or approved by instructor.

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 5, Civil Engineering/Mechanical and Aerospace Engineering 251 or instructor's consent.

303—Agricultural Building Design (3). Analysis, design and synthesis of buildings for agriculture and light industry. Prerequisite: 195.

315—Electricity and Electronics in Agriculture Engineering (3). Electric power distribution, wiring and lighting of nonindustrial buildings, motors and controls, microprocessors as control devices. Prerequisite: 124.

316—Agricultural Materials Processing (3). Applications of thermodynamics, fluid mechanics and heat transfer to the study of processing and handling of agricultural materials with respect to material properties. Prerequisites: 195, 216, Mathematics 304 and Civil Engineering/Mechanical and Aerospace Engineering 251.

321—Irrigation and Drainage Engineering (3). Soil, water and plant relationships. Water supplies. Surface and sprinkler irrigation. Surface and tile drainage. Prerequisite: 221.

340—Advanced Farm Power and Machinery (3). Analytical study of construction and operating characteristics of engines, tractors, selected farm machines. Use of instruments, experimental apparatus. Prerequisites: Mathematics 304 and computer programming.

350—Honors Thesis Research (2-4). Open only to honors students in agricultural engineering. Independent investigation in agricultural engineering to be presented as a thesis.

351—Food Process Engineering I (3). Study of transport phenomena and unit operations in food processing systems. Emphasis on rheology of processed foods, food heating and cooling processes and thermodynamics of food freezing. Prerequisite: Chemical Engineering 235 or instructor's consent.

361—Food Process Engineering II (3). Continuing study of transport phenomena and unit operations in food processing systems. Emphasis is on fluid food evaporation concentration, food dehydration, contact equilibrium processes and mechanical separation processes. Prerequisite: 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: senior standing.

395—Agricultural Engineering Design (3). Design of agricultural devices and systems. Prerequisite: senior standing or instructor's consent.

400—Problems (cr. arr.). Supervised individual study at the graduate level.

401—Advanced Topics in Agricultural Engineering (1-3). Study of advanced developments in agricultural engineering.

403—Advanced Agricultural Buildings (3). Advanced study of farm buildings and building design. Prerequisites: 303 and graduate standing.

410—Seminar (1). Recent investigations in agricultural engineering and related fields. Discussion of current literature; preparation and presentation of papers.

416—Agricultural Processing Engineering (3). Applies thermodynamics, fluid mechanics and heat transfer to problems in processing farm crops.

421—Water Management Theory (3). Advanced studies in erosion control, irrigation and drainage. Water resources engineering. Prerequisites: Mathematics 10, a computer science course, Agronomy 307 and a soil conservation course.

490—Research (cr. arr.). Independent investigation to be presented as a thesis.

Agronomy

College of Agriculture, Food and Natural Resources
135 Mumford Hall (314)882-2801

FACULTY

C. J. Nelson, chairman, professor, PhD, University of Wisconsin, crop physiology

D. G. Blevins, director of graduate studies, professor, PhD, University of Kentucky, plant physiology

S. C. Anand, professor, PhD, University of Wisconsin, soybean breeding

E. H. Coe Jr., professor, PhD, University of Illinois, corn genetics

L. L. Darrah, professor, PhD, Iowa State University, corn breeding

G. Kimber, professor, PhD, University of Manchester, wheat cytogenetics

M. G. Neuffer, professor, PhD, University of Missouri-Columbia, corn genetics

G. P. Redei, professor, CSc, University of Budapest, phsiology genetics

D. A. Sleper, professor, PhD, University of Wisconsin, forage grass breeding

P. R. Beuselinck, associate professor, PhD, Oregon State University, legume breeding

D. D. Buchholz, associate professor, PhD, Kansas State University, soil fertility and extension

J. P. Gustafson, associate professor, PhD, University of California-Davis, cereal genetics

H. D. Kerr, associate professor, PhD, Washington State University, weed science

R. J. Kremer, associate professor, PhD, Mississippi State University, microbiology

R. L. McGraw, associate professor, PhD, University of Florida, forage production

H. C. Minor, associate professor, PhD, University of Illinois, crop ecology and extension

D. W. Albers, assistant professor, PhD, University of Arkansas, cotton production

M. S. DeFelice, assistant professor, PhD, University of Kentucky, weed extension

W. W. Donald, assistant professor, PhD, University of Wisconsin, weed science

R. E. Joost, assistant professor, PhD, University of Georgia, forage management

K. D. Kephart, assistant professor, PhD, University of Idaho, grain crops extension

A. L. McKendry, assistant professor, PhD, University of Manitoba, small grains breeding

R. L. Myers, assistant professor, PhD, University of Minnesota, crop ecology and alternate crops

C. A. Roberts, assistant professor, PhD, University of Illinois, forage extension

R. E. Sharp, assistant professor, PhD, University of Lancaster, England, crop physiology

B. D. Sims, assistant professor, PhD, University of Arkansas, weed extension

P. W. Tracy, assistant professor, PhD, Colorado State University, soil fertility extension

W. J. Wiebold, assistant professor, PhD, University of Georgia, soybean extension

DEGREES: MS and PhD in agronomy

The MS degree in agronomy may emphasize crop science and genetics, or soil science. The PhD is offered in six general program areas: crop breeding and genetics, crop physiology and management, soil chemistry and biochemistry, soil pedology and mineralogy, environmental quality, soil-plant relationships and weed science.

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 with an interest in crop science or genetics should have completed courses in botany, genetics, inorganic and organic chemistry, bio-

chemistry, statistics, physics and advanced mathematics. Those planning to major in soil science should have completed courses in calculus, physics, geology, atmospheric science, and inorganic, analytical and organic chemistry. 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 selected from courses accepted for graduate credit at MU, 15 or more hours must be in courses 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 (crops and genetics or soils) and three are in the alternate area.

Most student programs include a thesis, an original work that demonstrates a capacity for research and independent thought. The non-thesis program, designed for those who have the need for 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 non-thesis 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 master's degree or its equivalent. Master's-level work must demonstrate the candidate's 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 generally includes 30 or more hours in graduate courses beyond those taken for the MS 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

201—Topics in Agronomy (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.

202—World Soils and Crops (2). Overview of the world soils influenced by climate as this affects the adaptation and production of major food, fiber and fuel crops. Emphasis will be placed on the linkage between human nutrition and crop production using sustainable farming systems. Studies on food crops for less developed and developing countries, potential for non-traditional legume, oil-seed, fiber and fuel crops for sustainable agricultural systems in industrialized countries are included.

203—Forage Crops (3). Principle forage crops, pasture production, preservation and utilization. Prerequisite: 30.

204—Grain Crops (3). Principle grain crops, grain crop production, harvest and utilization. Prerequisite: 30.

209—Principles of Weed Management (4) (same as Pest Management 209 and Horticulture 209). Principles of weed invasion, reproduction and persistence; of interference; of the relationship between production practice and weed control; and of the approaches for preventing weed emergence, minimizing weed competition and reducing weed propagules. Prerequisite: 30 or Biological Science 12 or equivalent.

225—Basic Plant Genetics (3). Basic concepts of plant genetics relevant to agriculture. Emphasizes breeding, production and protection against pathogens. Prerequisite: 30 or equivalent.

300—Problems (cr. arr.). Not accepted as a substitute for any regularly scheduled course. Problems arranged with individual faculty member in specific matter area. Prerequisite: instructor's consent.

301—Topics in Agronomy (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.

302—Fertilizer Technology and Use (3). Constituents, manufacture, plant requirements, soil-fertilizer interactions and proper utilization of fertilizers as a natural resource. Includes use of organic-protein materials and efficacy of non-traditional soil additives. Prerequisite: 100.

307—Soil Physics (5). (same as Natural Resources 307). Study of the physical properties of soils and theory and methodology of selected instrumentation for the evaluation of those properties. Topics include soil solids, water, solutes, aeration, and temperature. Prerequisites: 100, Physics 21 or equivalent.

308—Soil Conservation (3). (same as Natural Resources 308) Conservation of soil with respect to topsoil, soil productivity and fertility. Prerequisite: 100. Recommended: Agricultural Engineering 201.

309—Herbicides in Agronomic Habitats (3) (same as Pest Management 309 and Horticulture 309). Treats interacting biological, chemical and physical factors affecting the function and cycling of herbicides in plants and agronomic habitats. Prerequisites: 30, 100 and Biochemistry 193 or Chemistry 205.

312—Soil Microbiology (3). (same as Natural Resources 312) Micro-organic life of soil in relation to soil fertility. Prerequisites: 100 and general bacteriology.

313—Soil Fertility and Plant Nutrition (3). (same as Natural Resources 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: 30 and 100, Mathematics 10 and eight hours of college chemistry.

314—Soil Fertility and Plant Nutrition Laboratory (2). (same as Natural Resources 314) The application of elementary analytical procedures to the evaluation of the nutrient status of soils and crop plants. Prerequisite: concurrent or previous enrollment in 313.

315—Crop Physiology (3). Basic course in crop growth and development, emphasis on the role of crop physiology and morphology in management decisions. Prerequisites: 30 and Biochemistry 110 or equivalent.

320—Soil Genesis, Mapping and Classification (4). (same as Natural Resources 320) Identification of soils and soil systems in the natural landscape and factors and processes determining their development. Prerequisite: 100.

325—Field Crop Breeding (3). Principles underlying economic breeding of crop plants. Method of breeding major field crops. Prerequisites: 30 and 225.

328—Genetic Engineering (1). Covers the basic principles of genetic engineering using cytogenetic and molecular methods. Prerequisite: Agronomy 225 or equivalent.

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

343—Evolution of Genetic Concepts (2) (same as Biological Sciences 343). Discusses major hypotheses and evidences leading to development of current fundamental concepts. Prerequisite: 225 or Biological Science 202 or 238.

350—Special Readings (1-3). Individual study of assigned topics. Prerequisite: instructor's consent.

384—Cytogenetics (3) (same as Biological Sciences 384). Chromosome cytogenetics, mitosis, meiosis, aberrations, polyploidy, aneuploidy and regulation of chromosome pairing. Prerequisite: 12 hours in biology including some genetics and cytology, or instructor's consent.

385—Cytogenetics Laboratory (1) (same as Biological Sciences 385). Practical aspects of subjects dealt with in 384. Prerequisite: 384 or instructor's consent, may take 384 and 385 concurrently.

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

400—Problems (cr. arr.). Advanced studies not expected to terminate in thesis. Problems arranged with individual faculty member in specific matter area. Prerequisite: instructor's consent.

401—Topics in Agronomy (1-4). Instruction in specific subject matter areas in agronomy. Prerequisites: graduate standing and instructor's consent.

407—Advanced Soil Physics (3). (same as Natural Resources 407) Transport of mass and energy through soil, with emphasis on development of the equations of flow. Evaluation of analytical and numerical solutions to differential equations describing transport phenomena. Prerequisites: 307, Mathematics 304 or equivalent.

409—Weed Research Principles and Techniques (3). Current developments in weed science theory and methodology. Prerequisites: 209 and graduate standing.

410—Seminar (1). (same as Natural Resources 410) In-depth development of advanced aspects of crop and soil sciences through reviews of results of research in progress and current scientific publications.

414—Advanced Soil Fertility (3). (same as Natural Resources 414) History and application of concepts of soil fertility and plant nutrition. Prerequisites: 313 and 315 or equivalent, 14 hours of college chemistry and five hours of calculus.

415—Advanced Crop Physiology (3). Advanced course in crop growth and development. Emphasis on current and classical studies in crop physiology from seed germination through senescence. Prerequisites: 315 and Biological Sciences 313 or equivalent.

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 or pathogens. Prerequisites: 315 or Biological Sciences 313 and Biochemistry 270 or equivalent.

418—Soil Chemistry (3). (same as Natural Resources 418) Equilibrium, kinetic and biological principles describing mineral solubility and transformations in soil-water-plant systems. Prerequisites: calculus and a 300-level soil science course requiring chemistry.

419—Physical Chemistry of Soils (3). (same as Natural Resources 419) Theoretical basis for the application of physical, inorganic and electro-chemical concepts to soil systems. Prerequisites: 319 or Geology 342 and Chemistry 230.

420—Pedology (5). (same as Natural Resources 420) Soil-landscape relationships; quantitative soil morphological descriptions; temporal and spatial soil variability; soil forming processes; readings from current and classical pedological literature. Prerequisites: six hours of 300-level soils, or geology or instructor's consent.

425—Advanced Plant Breeding (3). The study of effects of mating system, inbreeding and selection on the genetic structure of populations. Prerequisites: 225, 325, 330 and Statistics 395.

429—Soil Chemistry Laboratory (2). Practice with the analytic instruments and techniques used to evaluate the chemical and mineralogical properties of soils. Prerequisites: 314 and previous or current enrollment in 418.

440—Applied Quantitative and Statistical Genetics (3). Estimation of genetic effects, using means and variances, environmental stability responses, index selection, and gain from selection. Prerequisites: 325, Statistics 385, Statistics 395 and Animal Science 423 or equivalent.

450—Non-thesis Research (1-9). (same as Natural Resources 450) Research not expected to terminate in dissertation.

490—Thesis Research (1-10). (same as Natural Resources

490) Original investigations in crop and soil sciences in support of thesis for master's and doctoral candidates.

Anatomy and Neurobiology

School of Medicine
M304 Medical Sciences Bldg. (314)882-2288

FACULTY

Willis K. Paull, chairman, professor, PhD, University of Southern California
R. Thomas Zoeller, director of graduate studies, assistant professor, PhD, Oregon State University
William J. Krause, professor, PhD, University of Missouri-Columbia
Willis K. Samson, professor, PhD, University of Texas-Southwestern Medical School
John D. Decker, associate professor, PhD, S.U.N.Y.-Upstate New York
Gary B. Dunkerley, associate professor, PhD, University of Texas, Medical Branch
Finley P. Gibbs, associate professor, PhD, University of Oregon
William R. Goodge, associate professor, PhD, University of Washington
Larry Petterborg, associate professor, PhD, University of Texas-San Antonio
P. Kevin Rudeen, associate professor, PhD, University of Texas-San Antonio
Marilyn J. Duncan, assistant professor, PhD, Worcester Polytechnic Institute
Sandra L. Petersen, assistant professor, PhD, Oregon State University
Carol Ward, assistant professor, PhD, Johns Hopkins University

DEGREES: MA and PhD in anatomy

The Department of Anatomy and Neurobiology offers courses of study at the graduate level, leading to the degrees of master of arts and doctor of philosophy. These programs are designed to prepare students for careers as basic medical scientists in the broad field of the morphological and neural sciences. Teaching and research interests of the department include gross morphology, descriptive and experimental histology and embryology, neuroendocrinology, chronobiology and neuroscience. The department also cooperates with the Department of Veterinary Biomedical Science to present a course of study for the PhD with research in veterinary anatomy.

The department is equipped to support investigations in many areas of morphology, cell biology and neurobiology. In addition to transmission and scanning electron microscopy, facilities for immunocytochemistry, in-situhybridization, radioimmunoassay, organ culture, neural transplantation and computer assisted microscopic image analysis are housed within the department.

MASTER'S DEGREE: The master's program in anatomy is designed for students who wish to expand their knowledge of morphology and gain an introduction to research. Although there is no obligation to do so, a student may elect to secure a master's degree as preparation for the PhD degree. The master's program also can be tailored to meet the needs of students in allied health professions, in nursing and medicine.

The admissions requirements and procedures for the master's program are the same as listed for the doctoral program. During the first academic year of the program, the student will complete the departmental courses in gross anatomy, microscopic anatomy, developmental anatomy and neuroscience, as well as courses in biochemistry and physiology. At the end of the second semester, the candidate should select a faculty adviser. The second year of the program is designed with the guidance of the adviser and doctoral program committee and is devoted to continued course work and preparation of a thesis.

DOCTORAL DEGREE: Applicants must have an undergraduate GPA of at least 3.0 (A=4.0) or equivalent during the last two years of undergraduate work and an overall GPA of at least 2.75 as well as GRE scores above the 50th percentile. The candidate also should have a minimum of 20 semester hours of biology, two years of chemistry (including inorganic and organic with laboratory), one year of physics and one year of college mathematics (calculus recommended). As adequate preparation for the program, the department recommends that an applicant should have completed courses in comparative anatomy, statistics and computer science. Candidates seeking entry into the PhD program should submit transcripts from all colleges and universities attended, GRE scores on the general test and on the subject test in biology and letters of support from at least three professors who have taught courses to the applicant. Where applicable, one of the three letters should be from the student's master's adviser. After evaluation of this material, the department determines the acceptability of the candidate.

All materials should be addressed to Director of Graduate Studies, Department of Anatomy and Neurobiology, School of Medicine, Columbia, Mo. 65212.

The following subjects are basic to the program and are required of all students: gross anatomy, microscopic anatomy, developmental anatomy, neuro-anatomy and biochemistry and physiology. Some students completing these courses during their earlier programs may have fulfilled these requirements before entering the doctoral program.

A further course of study will be constructed by the student's adviser and doctoral program committee, taking into consideration the student's past record and designated area of concentration.

During the course of training, the student is expected to gain at least one semester of teaching experience in gross anatomy and in such subdisciplines as recommended by the student's program committee.

Candidates are required to obtain at least B grades and are allowed only one C grade, except that no C grades are accepted in the core courses of the department.

At the end of the second semester in residence a written qualifying examination will be given over the required subdisciplines of human developmental and gross anatomy, histology and neuroscience. Between the end of the second and third years the student must pass a written and oral comprehensive examination to test abilities to integrate information, solve problems and effectively communicate ideas relevant to the course work and to the student's area of research interests. Finally, and most important, each candidate must initiate and complete an independent, original and scholarly research project that will provide the basis for the doctoral dissertation.

COURSES

222—Gross Human Anatomy (7). Gross structure and neuroanatomy of the human body; dissection of extremities, back, head, neck, abdomen and thorax. Prerequisite: five hours of biological science or equivalent.
300—Problems (cr. arr.). Regions or systems which may include developmental, microscopic and gross anatomy.
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.
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.
405—Mammalian Reproduction (3). Reproduction in mammals, with emphasis on the neuroendocrine control of the hormones involved in reproductive process biosyntheses, biologic actions, role. Prerequisites: graduate standing in one of animal, biologic, medical, or veterinary sciences, instructor's consent and biochemistry 304 or equivalent.
410—Seminar (1). Presentation and discussion of original investigations and current literature.
450—Research (cr. arr.). Work equal to research in 490, but not leading to dissertation.
490—Research (cr. arr.). Work leading to dissertation.

Ancient Studies Area

203 Switzler Hall (314)882-9402

FACULTY

Eugene N. Lane, chairman, professor of classical studies, PhD, Yale University
John H. Kultgen Jr., professor of philosophy, PhD, University of Chicago
Ralph M. Rowlett, professor of anthropology, PhD, Harvard University
Marcus Rautman, assistant professor of art history and archaeology, PhD, Indiana University
Alfred S. Bradford, professor of history, PhD, University of Chicago
Barbara P. Wallach, associate professor of classical studies, PhD, University of Illinois
Kathleen Slane, associate professor of art history and archaeology, PhD, Bryn Mawr College

The ancient studies area is an interdisciplinary program in anthropology, art history and archaeology, classical studies, history and philosophy offering a minor for both the MA and PhD degrees. Students who pursue graduate degrees in one of the participating departments are eligible to work for a minor in ancient studies. To participate in the program, make formal application to the chairman.

If accepted, approximately one-third of the course work will constitute a minor.

Specifically, students must satisfy the following requirements:

- for a master's degree with a minor in ancient studies, students must take at least nine, but no more than 15 hours of approved course work in at least one of the related departments other than the major department
- for a PhD degree with a minor in ancient studies, students must take at least 24 hours of approved course work (beyond the AB) in at least two of the related departments other than the major department. As part of these 24 hours, they must take at least one course at the 400 level in each of two separate, but related, departments.

Animal Sciences

College of Agriculture, Food and Natural Resources
S104 Animal Sciences Center (314)882-7266

FACULTY

Gary L. Allee, chairman, director of graduate studies, professor, PhD, University of Illinois
Ralph R. Anderson, professor, PhD, University of Missouri-Columbia
J. Malcolm Asplund, professor, PhD, University of Wisconsin
Clifton Baile, adjunct professor, PhD, University of Missouri-Columbia
Robert J. Collier, adjunct professor, PhD, University of Illinois
B. N. Day, professor, PhD, Iowa State University
George B. Garner, professor, PhD, University of Missouri-Columbia
H. Allen Garverick, professor, PhD, Purdue University
Harold D. Johnson, professor, PhD, University of Missouri-Columbia
John Massey, professor, PhD, University of Missouri-Columbia
Fredric A. Martz, professor, PhD, Purdue University
Charles P. Merilan, professor, PhD, University of Missouri-Columbia
Ronald E. Morrow, professor, PhD, University of Tennessee
John A. Paterson, professor, PhD, University of Nebraska
John C. Rea, professor, PhD, University of Missouri-Columbia
Rex R. Ricketts, professor, PhD, University of Missouri-Columbia
R. Michael Roberts, professor, PhD, Oxford University
John D. Sikes, professor, PhD, University of Missouri-Columbia
Michael F. Smith, professor, PhD, Texas A&M University
Barry J. Steevens, professor, PhD, Oklahoma State University
J. M. Vandepopuliere, professor, PhD, University of Florida
Trygve L. Veum, professor, PhD, Cornell University
Dale W. Vogt, professor, PhD, University of Minnesota
James E. Williams, professor, PhD, West Virginia University
Ronald L. Belyea, associate professor, PhD, Oklahoma State University
George Jesse, associate professor, PhD, University of Missouri-Columbia
Duane Keisler, associate professor, PhD, West Virginia University
Diane Killian, adjunct associate professor, PhD, University of Missouri-Columbia
William R. Lamberson, associate professor, PhD, University of Nebraska
R. Jerry Lipsey, associate professor, PhD, Kansas State University
Wayne E. Loch, associate professor, PhD, University of Missouri-Columbia
John Warren, adjunct associate professor, PhD, University of Maryland
Maurice Alexander, assistant professor, MS, University of Missouri-Columbia
Ronald O. Bates, assistant professor, PhD, Oklahoma State University
B. Ann Becker, adjunct assistant professor, PhD, University of Missouri-Columbia
M. A. Della-Ferra, adjunct assistant professor, PhD, University of Pennsylvania
Jeffre D. Firman, assistant professor, PhD, University of Maryland
Kevin L. Fritsche, assistant professor, PhD, University of Illinois
John Holste, adjunct assistant professor, DVM, Kansas State University
Monty S. Kerley, assistant professor, PhD, University of Illinois
David Ledoux, assistant professor, PhD, University of Florida
Wayland McKenzie, adjunct assistant professor, PhD, University of Missouri-Columbia
Steven Meredith, adjunct assistant professor, PhD, University of Missouri-Columbia
R. Jeffrey Moffatt, assistant professor, PhD, University of Florida
Randall Prather, assistant professor, PhD, University of Wisconsin-Madison
Kathy Sharpe, assistant professor, PhD, University of Tennessee
Jack C. Whittier, assistant professor, PhD, University of Nebraska

DEGREES: MS and PhD in animal sciences

A student may pursue any of the following areas of concentration: nutrition, physiology, genetics, growth and development, production and management. These programs are designed to prepare students for advanced professional careers in academia (teaching, research and extension) and industry. Animal sciences, is a broad and rapidly changing field, demands a variety of training. Accordingly, graduate programs include course work in biochemistry, genetics, management, microbiology, 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 3.3-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, poultry, 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 the Director of Graduate Studies, S104 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 admissions 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 1,000 minimum
- provide three letters of reference
- 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 at the same time.

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
- provide three letters of reference, one of which must be from a previous academic adviser
- have a TOEFL score of 500 minimum, if international student whose native language is not English. The nature of the qualifying examination is determined by the student's doctoral program committee.

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.

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

COURSES

200—Problems (1-2). Library and laboratory study of assigned problems in animal breeding, nutrition, physiology, or production and management. Planning, conducting and reporting to be in consultation with instructor. Prerequisite: instructor's consent.

202—Principles of Animal Nutrition (3). Fundamentals of animal nutrition application to livestock production. Prerequisites: Biochemistry 110 or Chemistry 205 or 210 and Mathematics 10.

204—Advanced Meats (3) (same as Food Science and Nutrition 204).

210—Junior Seminar (1). Lecturers and/or discussion will address topics related to the various course objectives, such as, career opportunities, resume development, interviewing, graduate or professional school, MU's role in research, teaching, extension and international programs, and animal science related topics. Prerequisite: junior standing.

212—Applied Nutrition (3). Feed composition and utilization, ration formulation, feed evaluation and identification, practical problems. Prerequisite: 202 or concurrent enrollment.
213—Genetics of Livestock Improvement (3). Applies genetic principles to improvement of domestic animals. Considers methods available to breeder and their effectiveness. Prerequisite: 11.
254—Physiology of Domestic Animals (3). Basic concepts of mammalian physiology with comparative emphasis placed on domestic animals. Structure and function of the various organ systems with emphasis placed on regulation of function and homeostatic controls. Prerequisites: Biology 10 or 11, and Chemistry 210 or Biochemistry 110.
264—Physiology of Domestic Animals Laboratory (2). Examination of structure-function relationships for various mammalian organ systems. Prerequisites: Biology 10 or 11, and Chemistry 210 or Biochemistry 110. Must be enrolled in or have taken and passed with a C or better Animal Science 154 or equivalent.
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.
285—Advanced Dairy Cattle Judging (2). Continuation of 115. Includes field trips. Prerequisite: 115.
300—Problems (cr. arr.). 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.
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. Prerequisite: instructor's consent.
302—Monogastric Nutrition (3). Principles of nutrition, feed formulation and recent research in poultry feeding. Prerequisites: 202 and Biochemistry 193 is recommended.
304—Physiology of Reproduction (4). Principles of animal reproduction with emphasis on endocrine control of reproductive processes. Prerequisites: Biology 11, Animal Science 154 or equivalent.
305—Beef Production and Management (3). Systems of beef production breeding, feeding, management of commercial and purebred beef cattle. Prerequisites for majors: 15, 212 and 213. Non-majors: 11 and 15. Agronomy 304 and Animal Science 304 are recommended.
312—Nutrition Technology (3). The application of nutritional principles to feed formulation, manufacture and quality control. Prerequisites: 202, 212 and computer literacy.
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: 15 and 212 or equivalent.
323—Applied Animal Genetics (3). Applies genetic principles to the improvement of farm animals. Laboratory periods designed to provide experience in the development and use of statistics important in breeding programs. Prerequisites: 213 and Statistics 207.
325—Horse Production (3). Systems of horse production breeding, feeding and management of horses. Prerequisites: 202, 212, 213 and 304.
335—Poultry Meat Production (3). Study of breeder flock, hatching, growing and disease control principles in poultry meat production. Prerequisites: 154 and 202.
345—Sheep Production and Management (3). Systems of sheep and wool production breeding, feeding, management of commercial and purebred sheep. Prerequisites: 202, 212 and 304.
355—Swine Production (3). Systems of pork production breeding, feeding, management of commercial and purebred swine. Prerequisites: 202, 212. 213 and 304.
360—Microbiology of Anaerobic Ecosystems (3) (same as Agricultural Engineering-Agriculture 360). The microbiology of the anaerobic degradation of organic matter to short chain acids, methane and carbon dioxide.
375—Poultry Egg Production (3). Principles of housing systems, feeding regimes, egg production, processing and marketing.
383—Bovine Breeding (3). Genetic principles, breeding systems and practices for improving cattle. Prerequisite: 213 or equivalent.
384—Artificial Breeding (3). Reproductive processes; selection, evaluation, storage of semen; insemination techniques; artificial
390—Internship in Animal Science and 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.
394—Semen and Ova Processing (3). Research techniques involved in spermatozoa, ova and embryo collection, processing and storage. Prerequisite: 384.
400—Problems (1-2). 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 207 or equivalent or instructor's consent.
402—Animal Nutrition (3) (same as Nutrition 402). More important works contributing to knowledge of animal nutrition. Prerequisites: 202 and a course in biochemistry.
410—Seminar (1). Critical consideration of research and other selected subjects in animal breeding, animal nutrition, livestock production and management. Students indicate at enrollment the area of study.
411—Livestock Feeding Investigations (2). Assigned readings of significant papers. Special reports. Prerequisite: 402.
412—Animal Nutrition Laboratory Techniques (3). To provide students with experience in laboratory techniques having universal application to nutrition research which are not discussed by other laboratory techniques courses. Prerequisites: Mathematics 60, Chemistry 210, Chemistry 211, Chemistry 212 and Biological Sciences 212.
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 and milk secretion.
422—Nutritional Aspects of Carbohydrate Metabolism (2). Integration of pathways involved in carbohydrateand energy metabolism. Prerequisites: Biochemistry 270 and Biochemistry 272.
423 Genetics of Populations (4) (same as Biological Sciences 423).
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.
430—Physiology of Milk Secretion (3). Physiology and biochemistry of milk secretion.
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.
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 cyrogenic temperatures and dehydration.
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.
440—Bioenergetics (3) (same as Nutrition 440). Energetic interactions of animals and their physical and nutritional environments.
440—Topics in Animal Science (cr. arr.). Prerequisites: graduate standing and instructor's consent.
450—Research (cr. arr.). 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 consent of instructor.
462—Lipid Metabolism and Health (3) (same as Nutrition 462 and Human Nutrition and Foods 462). Provide the graduate student with a critical understanding of current developments in lipid metabolism in animals and humans particularly as it relates to nutrition and health. Prerequisites: Biochemistry 270 and 272.
490—Research (cr. arr.). Investigations in animal breeding, animal nutrition, livestock production and management. Thesis required.

Anthropology

College of Arts and Science
200 Swallow Hall (314)882-4731

FACULTY

Samuel D. Stout, chairman, professor, PhD, Washington University-St. Louis
R. Lee Lyman, director of graduate studies, associate professor, PhD, University of Washington
Robert A. Benfer, professor, PhD, University of Texas
Louanna Furbee, professor, PhD, University of Chicago
Peter M. Gardner, professor, PhD, University of Pennsylvania
James A. Gavan, professor emeritus, PhD, University of Chicago
Michael J. O'Brien, professor, PhD, University of Texas
Michael C. Robbins, professor, PhD, University of Minnesota
Ralph M. Rowlett, professor, PhD, Harvard University
Robert F. G. Spier, professor emeritus, PhD, Harvard University
H. Clyde Wilson, professor, PhD, University of California-Los Angeles
W. Raymond Wood, professor, PhD, University of Oregon
Robert T. Bray, associate professor emeritus, MA, University of Missouri-Columbia
James W. Hamilton, associate professor, PhD, University of Michigan
Mark V. Flinn, assistant professor, PhD, Northwestern University
Lisa Sattenspiel, assistant professor, PhD, University of New Mexico
Carol V. Ward, assistant professor, PhD, Johns Hopkins University School of Medicine
Deborah M. Pearsall, assistant professor, PhD, University of Illinois-Urbana

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 an-

thropology 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
- physical 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 numerous parts of the world. Off-campus research facilities include the Sinclair Farm Research Facility just south of Columbia, the Lyman Archaeological Research Facility in Miami, Mo. (one hour away) and the Southeast Missouri Archaeological Research Center in Naylor, Mo. (five hours away).

Geographical areas of current departmental research include, in addition to Missouri, the Northwest Coast (archaeology), the Great Plains (archaeology and linguistics), the Gulf Coast (cultural anthropology), the Mississippi River Valley (archaeology), Switzerland (archaeology), Ecuador (archaeology), Peru (archaeology, physical anthropology and linguistics) and Dominica (physical 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 no later than February 1 each year.

Address inquiries to the Department of Anthropology, 200 Swallow Hall, Columbia, Mo. 65211.

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 (or prehistory), linguistics and physical 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 (A=4.0) GPA for the last 60 hours of undergraduate courses and a score of 1,000 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. This examination includes, but is not limited to, material on an MA reading list compiled by the student in consultation with his committee.

A thesis or formal research project, 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, composed of the adviser, three members of the department and a faculty member from outside the department. 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 (stipends for which are awarded competitively) for one semester 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 departmental application materials should be filed by February 1 each year 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 or experimental development of new content areas. May be repeated to a maximum of nine 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. Sophomore standing or instructor's consent. Every third semester.

229—Cultures of Asia (3). Survey of peoples and cultures of Asia, and emphasis on native societies of the area. Prerequisite: sophomore standing or instructor's consent.

236—North American Indian Culture (3). Comparative study of American Indians north of Mexico, emphasizes the eastern United States. Prerequisite: 153.

240—Aztec, Maya and Inca Civilizations (3). Origin of native Americans and development of American civilizations emphasizing Aztecs, Mayas, and Incas; rise of these civilizations known from archaeology, early European and early native American accounts, and the condition of the descendants today. Sophomore standing.

250—Human Reproductive Ecology (3). Biological and cultural aspects of human reproduction are examined from the perspective of evolutionary and ecological theory. Emphasis is placed on the variability of reproductive behavior in other cultures. Prerequisites: one course in anthropology, biology or psychology, or junior/senior standing.

255—Cultures and Civilizations of the World (3). Systematic description and ordering of world cultures from foraging bands to nation-states; culture contact, change and psychological responses. Prerequisite: sophomore standing or instructor's consent.

260—The Third World: An Anthropological Perspective (3) (same as Peace Studies 261). Consideration of problems in developing nations neo-colonialism, peasant revolutions, overpopulation and under-industrialization in the context of cultural change. Prerequisite: 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. Prerequisite: sophomore standing or instructor's consent.

265—Male and Female (3). Comparative anthropological findings of the male and female in politics, subsistence and art in primitive, peasant and modern cultures. Cultural and biological theories about sexually defined roles. Behavioral evolution of monkeys, apes and humans. Prerequisites: three hours of behavioral science.

270—Culture as Communication (3) (same as Communication 270 and Linguistics 270). Study of the influence of culture on communication processes. Examines topics as the impact of values, languages and non-verbal behavior on intercultural interaction. Prerequisite: junior/senior 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.

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/senior standing, honors level GPA and instructor's consent.

299—Honors in Anthropology (3). Continuation of 298. Prerequisites: junior/senior standing, honors level GPA and 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.

Anthropology

306—Sociolinguistics (3) (same as Linguistics 306). Studies covariation of linguistic structure and society; surveys current sociolinguistic literature; topics multilingualism, black English, social factors in language change, social dialectology its methods and theory. Prerequisites: one course in linguistics and 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 area linguistics. Prerequisites: junior/senior standing or instructor's consent.

309—Microcomputer Applications in Simulations in Anthropology (2). After an introduction to microcomputers and their operating systems, major applications will be taught, followed by individually guided study of anthropological applications. Prerequisite: six upperclass hours of anthropology or instructor's consent.

310—Ethnographic Studies of Selected Cultures (3). Specific content varies with student interest and faculty availability. Will concentrate on peoples and cultures of one area such as East Asia, South Asia, Africa, North America, Mesoamerica, Oceania and Europe. Amplifies ethnographic knowledge gained in lower-level survey courses. Prerequisites: senior/graduate standing or instructor's 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: 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: nine hours of upperclass behavioral sciences.

324—Preindustrial Technology (3). Technological pursuits of nonliterate peoples stone working, basketry, pottery, metallurgy. Description, analysis of technical, economic, social aspects. Prerequisite: junior/senior standing or instructor's consent.

326—Advanced Cultural Anthropology (3). Nature of culture. Critical examination of varying uses made of the concept of culture by social scientists; implication of these concepts for anthropological method and theory. Prerequisite: 153 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. Prerequisite: 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 among individuals and groups in non-literate societies. Prerequisite: 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 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 ethnobiology; integration of ethnobiological and archaeological data. Critique of original works in the field emphasized. Prerequisite: junior/senior standing or instructor's consent.

337—Zooarchaeology (3). Survey of specialized techniques for archaeological/faunal analysis, including zooarchaeological sampling, taphonomy, study of paleoecology and recognition of domestication. Prerequisite: junior/senior standing or instructor's consent.

338—Historical American Archaeology (3). Lecture and laboratory course concerned primarily with EuroAmerican archaeological resources. Emphasis is on 19th-century midwestern settlement systems and types, architecture, technology, classification, intra-site patterning and principal date classes. Prerequisite: junior/senior standing or instructor's consent.

339—Field Research in Historical American Archaeology (3). Stresses specialized field techniques in location, identification and excavation of features common to historical sites; correlates historical data with approach to and products of excavation. Prerequisite: 338 or instructor's consent.

340—North American Archaeology (3). Ancient peoples and development of American Indian culture. Prerequisite: 152 or 240.

341—Archaeology of South America (3). Development of culture in South America from the Pleistocene to European contact. Prerequisite: 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).

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 and 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. Prerequisite: 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. Prerequisite: 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 (cr. arr.). 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 A.D. 1700. Emphases include intellectual and theoretical developments, field and laboratory techniques and major figures in the history of the discipline. Prerequisite: 152 or instructor's consent.

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 bioarchaeological problems and modern forensic techniques for personal identification. Prerequisite: 150 or instructor's consent.

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. Prerequisite: junior/senior standing or instructor's consent.

362—Cultural Evolution and Change (3). The processes of culture innovation, diffusion, integration, patterning, acculturation and others, examined in literate and non-literate contexts. Prerequisite: 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. Prerequisite: 153 or instructor's consent.

364—Human Origins (3). History and theory in the study of human paleontology. Prerequisite: 150 or instructor's consent.

366—Human Biological Variation (3). Human biological variation among and within living populations. Evolutionary, genetic, ecological, demographic and especially cultural factors that contribute to biological variation. Prerequisite: 150 or Biology 1.

367—Ethnographic Methods (3). Relation of problems to techniques; surveys techniques of gathering data; discusses their limitations and potentials. Prerequisite: nine hours of anthropology or instructor's consent.

368—Old World Prehistory (3). Beginnings of culture in the old world through the early Iron Age. Prerequisite: 152 or instructor's consent.

369—Primate Social Behavior (3). Prerequisites: 60, 150, or instructor's consent.

371—Introduction to General Linguistics (3) (same as Linguistics 371 and Romance Languages 371). Fundamentals of linguistic theory, collateral readings and problems.

372—Techniques in Linguistic Analysis (3) (same as Linguistics 372 and Romance Languages 372). Problems in analyzing data from various languages. Prerequisite: introductory course in linguistics or instructor's consent.

373—Linguistic Phonetics (3) (same as Linguistics 373 and Romance Languages 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.

374—Issues in Linguistic Analysis (3) (same as Linguistics 374 and Romance Languages 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.

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: six hours of linguistics and instructor's consent.

400—Problems (cr. arr.). Directed research not leading to thesis or dissertation. Prerequisite: departmental consent.

405—History of Anthropology (3). Growth of anthropological theories, methods and perspectives; major figures and contributions in each subdiscipline. Prerequisite: graduate standing or instructor's consent.

420—Independent Reading in Preparation for Comprehensive Exam-PhD (1-8). Independent readings for PhD comprehensives. Open only to PhD candidates who have completed all but final semester of course work. Prerequisite: consent of major adviser.

436—Seminar in Anthropological Methods (3). Prerequisite: nine hours of anthropology or instructor's consent. May repeat to nine hours maximum.

437—Seminar in Ethnohistory (3). Prerequisite: instructor's consent.

442—Field Problems in Archaeology (2-9). 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. Prerequisite: 152 or 153. May repeat to six hours maximum.

444—Seminar in Archaeological Research (3). Readings

and critical evaluation of selected problems in archaeological research. Prerequisite: 12 hours of anthropology. May repeat to nine 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 nine 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 (cr. arr.). Original research not leading to the preparation of a dissertation.

451—Problems in Physical Anthropology (2-8). Concentrated work upon the definition and solution of problems in physical anthropology and human biology, with origination of or participation in research projects. Prerequisite: 366 or instructor's consent.

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. Prerequisite: 366 or instructor's consent.

461—Seminar in Psychological Anthropology (3). Focuses on developments in psychological anthropology and cross-cultural psychology. Special attention on cognition, perception, socialization, personality assessment, psychocultural change, psycho-linguistics, psychometrics, within cross-cultural contexts. Prerequisite: instructor's consent. May repeat to six hours maximum.

462—Seminar in Cultural Dynamics (3). Prerequisite: 326 or 362 or instructor's consent. May repeat to six hours maximum.

465—Seminar in Ethnological Theory (3). Prerequisite: six hours of anthropology or instructor's consent. May repeat to nine 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 nine hours maximum. Prerequisites: eight hours of anthropology and 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 nine hours maximum.

490—Research (cr. arr.). Advanced work leading to thesis or dissertation. Prerequisite: consent of major adviser.

493—Phonology (3) (same as Linguistics 493 and Romance Languages 493). Examination of current theory and methods of describing sound patterns of language; particular attention to the generative model and distinctive features. Prerequisites: 373 and 374.

494—Syntax (3) (same as Linguistics 494). Surveys various theories of syntax, closely examines the theory of generative transformational grammar and reviews the relevant literature. Prerequisite: a course in syntactic theory.

Art

College of Arts and Science
A126 Fine Arts (314)882-3555

FACULTY

Oliver A. Schuchard, chairman, professor, MFA, Southern Illinois University

William A. Berry, director of graduate studies, professor, MFA, University of Southern California

Robert Pringle, director of undergraduate studies, associate professor, MA, MFA, University of Kansas

Jerry D. Berneche, professor, MFA, Ohio University

Larry Kantner, professor, EdD, Pennsylvania State University

Lawrence Rugolo, professor, MFA, University of Iowa

Frank H. Stack, professor, MA, University of Wyoming

Robert F. Bussabarger, professor emeritus, MA, Michigan State University

Elizabeth T. Montminy, professor emeritus, BA, Radliffe

Brooke B. Cameron, associate professor, MA, University of Iowa

Adrienne W. Hoard, associate professor, EdD, University of Illinois

James H. Calvin, assistant professor, MFA, Bowling Green University

James J. Froese, assistant professor, MA, Wichita State University

James Sadler, assistant professor, BFA, Massachusetts College of Art

Daniel J. Frye, instructor, PhD, Syracuse University

DEGREE: MFA in art

The Department of Art, with studio courses in drawing, design, graphic design, ceramics, jewelry, painting, photography, printmaking, sculpture and weaving, offers the master of fine arts degree. Students desiring 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 a number of 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 examples. Art collections, which include the Museum of Art History and Archaeology, are described in the section Facilities and Resources. Ellis Library has extensive and excellent holdings of books, periodicals and reference materials pertaining to 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. Nonteaching 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.

In addition to meeting the general admission requirements of the Graduate School, the applicant must have completed the bachelor of fine arts degree as established at this school, or its equivalent. 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 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.

Examples of work to be submitted should emphasize the area in which the student intends to major. Examples of representational drawing (including figure drawing) also must be included. Students whose preparation in art is deficient, as determined by the graduate committee, are required to take additional work before proceeding with the graduate program. Upon acceptance, the student must report to the chairman of the departmental committee on graduate studies for assignment of an adviser.

The program for the degree is planned with an adviser in the area of specialization. Of the 60 credit hours required for the degree, 54 credit hours are in studio art courses, with a minimum of 30 hours in a double major (drawing-painting, design-crafts) and nine in the minor area. A one-credit- hour course, 303 Studio Seminar is required. The remaining 15 hours may be in studio courses outside the major area. The six hours not in studio art are taken in art history. 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.

A two-part thesis is required and must include

- an exhibition selected and installed by the student to demonstrate professional achievement
- a photographic record of the 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—Beginning Ceramics (3). Artistic fabrication of clay through basic forming, ornamentation, glazing and firing; includes study of ceramic design, technology, history and contemporary movements. Payment of expendable materials expense is required. Prerequisites: 2 and 20.

330—Intermediate Ceramics (3). Continuation of 230 with emphasis on throwing and glaze formulation. Payment of expendable materials expense is required. Prerequisites: 230 and 220 or 285 or 250.

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. Prerequisites: 330 and, if repeated, Chemistry 1. May be repeated to 12 hours maximum.

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 nine hours maximum.

430—Graduate Ceramics (3). Advanced study of ceramic technology and design concepts with emphasis on directed development of individual work. Payment of materials expense is required. Prerequisite: 331. May be repeated to 12 hours maximum.

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.

COMPOSITION

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.

370—Experimental Media II (3). Continuation of 270. Prerequisite: 270.
371—Experimental Media III (3). Continuation of 370. Prerequisite: 370. May repeat to nine hours maximum.
470—Experimental Media IV (3). Advanced study of compositional organization at the graduate level. Prerequisites: 371 and graduate standing. May repeat to nine hours maximum.

DESIGN

220—Beginning Spatial Design (3). Preliminary studies of the elements of three-dimensional form as they are embodied in a variety of structural materials. Prerequisite: 20.
221—Space, Form and Structure (3). Advanced study of three-dimensional form; basic structural systems and machine production emphasized. Prerequisite: 220.
320—Space, Light and Color (3). Advanced study of three-dimensional form with emphasis upon spatial effects of light and color. Prerequisite: 220.
321—Advanced Spatial Design (3). Advanced study of three-dimensional design; practical application of spatial design. Repeatable to 15 hours. Prerequisites: 221 and 320.
421—Graduate Spatial Design (3). Comprehensive study of three-dimensional design, emphasis on creative expression based on original theoretical research. Prerequisites: 322 and graduate standing. Repeatable to 15 hours.

DRAWING

260—Intermediate Drawing (3). Continuation of 160. Expendable materials fee required. Prerequisite: 160.
265—Anatomical Drawing (3). Anatomical structure of human figure as it relates to art. Drawing from live model, emphasis is on gross anatomy as defined by skeletal and muscular structure. Expendable materials fee required. Prerequisites: sophomore standing and two semesters of drawing.
273—Intermediate Color Drawing (3). Continuation of 173, with emphasis on design and organization. Prerequisite: 173.
360—Advanced Drawing (3). Continuation of 260, with increased emphasis on expressive drawing. Prerequisite: 260. Repeatable to 15 hours. Expendable materials fee required.
365—Advanced Anatomical Drawing (3). Continuation of 265, with emphasis on formal analysis of the figure in drawing based on superficial and deep anatomical structure. Prerequisites: 260 or 265 and graduate standing. Expendable materials fee required.
373—Advanced Color Drawing (3). Continuation of 273 with emphasis of the expressive properties of color in figural compositions. Prerequisite: 273 or consent of instructor. Repeatable to 15 hours.
460—Graduate Drawing (3). Continuation of 360 with emphasis on individual creative expression. Prerequisites: 360 and graduate art major. Repeatable to 15 hours. Expendable materials fee required.
463—Graduate Color Drawing (3). Continuation of 373 with emphasis on individual creative expression. Prerequisites: 373, consent of instructor and graduate standing. Repeatable to 15 hours.

FIBERS

240—Intermediate Fibers (3). Patterns and pattern drafting for four-harness looms. Off-loom weaving. Expendable materials fee required. Prerequisite: 140.
340—Advanced Fibers (3). Projects in off-loom, four-harness or multiharness weaving. Prerequisite: 240. Repeatable to 15 hours. Expendable materials fee required.
440—Graduate Fibers (3). Individual assigned projects in off-loom, four-harness and multiharness weaving. Prerequisites: 340 and graduate standing. Repeatable to 15 hours. Expendable materials fee required.

GRAPHIC DESIGN

210—Introduction to Calligraphy (3). Hand lettering based on the Italic Basic Roman and Book Hand alphabets. Historical and technical instruction; application of lettering in page layout. Prerequisite: sophomore standing or consent of instructor.
222—Graphic Design I (3). Investigation of letter forms, their historical development and visual properties. Studio problems incorporating graphic techniques of lettering and italic calligraphy applied to contemporary design principles. Expendable materials fee required. Prerequisites: 21 and 60.
223—Graphic Design II (3). Study of design process applied to specific graphic design forms such as logo and poster design using typographic and photographic techniques. Emphasizes development of visual concepts. Expendable materials fee required. Prerequisite: 222.
310—Advanced Calligraphy (3). Historical and technical study of three European broad pen alphabets Ninth Century Uncial, Rustic and Fraktur. Includes design and lettering of a handmade book. Prerequisite: 210.
323—Graphic Design III (3). Application of contemporary design concepts and techniques to a variety of problems resulting in comprehensive and camera-ready designs incorporating word and image components. Diffusion transfer and phototype techniques. Expendable materials fee required. Prerequisite: 223.
324—Graphic Design IV (3). Continuation of Graphic Design III with emphasis on integration of verbal and visual ideas. Design problems suited to a professional portfolio. Expendable materials fee required. Prerequisite: 323.
326—Graphic Illustration I (3). Exploration of editorial illustration from initial conception through layout design incorporating type. Practical, technical aspects of illustration, including black and white line art, color separations and full-color reproduction processes. Prerequisites: 223 and Drawing III.
422—Graphic Design V (3). Continuation of Graphic Design IV with emphasis on professional design methods and techniques. Expendable materials fee required. Prerequisites: 324 and graduate standing.

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. Expendable materials fee required. Prerequisites: 20 and 220.
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 and instructor's consent.
351—Enameling (3). Techniques of applying enamels to nonferrous metals. Payment of expendable materials expense is required. Prerequisites: 250, 350 and instructor's consent.
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. Prerequisites: 350, 250 and instructor's consent.
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 nine hours maximum.
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 and instructor's consent. May be repeated to 15 hours maximum.

PAINTING

277—Intermediate Painting (3). Continuation of 177, with the addition of portrait painting. Prerequisite: 177. Expendable materials fee required.
377—Advanced Painting (3). Advanced problems in oil and acrylic painting. Prerequisite: 277. May be repeated to 15 hours maximum. Expendable materials fee required.
477—Graduate Painting (3). Advanced study continued. Emphasis on individual creative expression. Prerequisites: 377 and graduate art major. May repeat to 15 hours maximum. Expendable materials fee required.

PHOTOGRAPHY

225—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: eight hours of studio art.
325—Intermediate Photography (3). Continuation of 225 with emphasis on advanced photo techniques and photographic image making. Payment of expendable materials expense is required. Prerequisite: 225. May repeat to 15 hours maximum.
425—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: 325 and graduate standing. May repeat to 15 hours maximum.

PRINTMAKING

290—Relief Printmaking (3). Relief printing techniques in color and black and white, includes woodcut and mixed media. Prerequisites: 2, 21 and one semester of drawing. May be repeated to six hours maximum. Expendable materials fee required.
291—Intaglio Printmaking (3). Intaglio printing techniques, including etching, engraving and aquatint. Prerequisites: 2, 21 and two semesters of drawing. May repeat to six hours maximum. Expendable materials fee required.
292—Lithography (3). Lithographic printing techniques from stone and metal plates. Prerequisites: 2, 21 and two semesters of drawing. Expendable materials fee required.
390—Advanced Printmaking (3). Advanced study in relief, intaglio or lithographic printmaking, with emphasis on individual creative expression. Prerequisites: 290 or 291 or 292. May repeat to 15 hours maximum. Expendable materials fee required.
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.

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.
301—Topics (4). Special studies in studio art; covers subjects not included in regularly offered courses. Prerequisites: junior standing and instructor's consent.
302—Senior Seminar (1). A capstone course for the undergraduate art degree with emphasis on the production of a written statement relating to the students' visual research. Prerequisites: senior standing.
303—Studio Seminar (1). Seminar on the practical and philosophical concerns of the visual artist. Students planning to apply for a teaching assistantship are strongly advised to enroll. Prerequisite: senior or graduate standing.
402—Graduate Collaboration (1-4). Collaborative projects involving two or more students in the Department of Art.
403—Historic Research in Drawing, Painting and Design (1-4). Investigation of historic precedent in drawing, paint-

ing and design.

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. Required of all MFA candidates.

424—Problems in Design (1-12). Graduate-level work in graphic design. Prerequisites: 422 and departmental consent.

429—Problems in Photography (1-12). Supervised research in creative photography. Prerequisites: 425 and graduate standing.

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.

456—Historic Research in Artcrafts (1-4). Prerequisite: departmental consent.

464—Problems in Drawing (1-12). Prerequisites: 460 and departmental consent.

474—Problems in Experimental Media (1-12). Independent study at the graduate level. May be repeated to a maximum of 12 hours. Prerequisites: 470 and graduate standing.

479—Problems in Painting (1-12). Prerequisites: 477 and departmental consent.

489—Problems in Sculpture (1-12). Prerequisites: 485 and departmental consent.

494—Problems in Printmaking (1-12). Prerequisites: 490 and departmental consent.

499—Problems in Serigraphy (1-12). Prerequisites: 496 and instructor's consent.

SCULPTURE

285—Beginning Sculpture (3). Principles of sculptural organization, figure studies, modeling techniques and simple plaster casting. Payment of expendable materials expense is require. Prerequisites: 5, 20, 165 or 160.

385—Intermediate Sculpture (3). Continuation of 285. Introduction to carving techniques. Payment of expendable materials expense is required. Prerequisite: 285.

386—Wood and Stone Carving (3). Advanced carving technique. Payment of expendable materials expense is required. Prerequisite: 385. May repeat to 12 hours maximum.

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 six hours maximum. f,w.

388—Sculptural Welding and Metal Casting (3). Payment of expendable materials expense is required. Prerequisite: 385. May repeat to six hours maximum.

485 Advanced Sculptural Composition (3). Payment of expendable materials expense is required. Prerequisites: 386 or 387 or 388 and graduate standing. May repeat to 15 hours maximum.

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 and one semester of drawing.

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.

496—Graduate Serigraphy (3). Advanced problems in serigraphy with emphasis on creative expression through a combination of methods. Payment of expendable materials is required. Prerequisites: 396 and graduate art major. May repeat to 15 hours maximum.

WATERCOLOR

275—Intermediate Water Color (3). Expendable materials fee required. Continuation of 175. Prerequisite: 175.

375—Advanced Water Color (3). Advanced problems in water color. Prerequisite: 275. May repeat to 15 hours maximum. Expendable materials fee required.

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.

Art History and Archaeology

College of Arts and Science
109 Pickard Hall (314)882-6711

FACULTY

Norman Land, chairman, associate professor, Italian renaissance art and baroque art, PhD, University of Virginia

William Biers, professor, Greek art and archaeology, PhD, University of Pennsylvania

Osmund Overby, professor, architecture and American art, PhD, Yale University

Edzard Baumann, associate professor, medieval and northern renaissance art, PhD, University of Vienna

Patricia Crown, associate professor, 18th- and 19th-century art, PhD, University of California-Los Angeles

Howard Marshall, associate professor, American folk art and director of the Missouri Cultural Heritage Center, PhD, Indiana University

Kathleen Warner Slane, associate professor, Roman art and archaeology, PhD, Bryn Mawr College

Karen Kleinfelder, assistant professor, modern art, PhD, University of Michigan

Marcus Rautman, assistant professor, Byzantine art and archaeology, PhD, Indiana University

Homer Thomas, professor emeritus, PhD, University of Edinburgh

Vera Townsend, associate professor emeritus, PhD, Emory University

Saul Weinberg, professor emeritus, PhD, Johns Hopkins University

ADJUNCT FACULTY

Jane C. Biers, curator of ancient art, Museum of Art and Archaeology, PhD, University of California-Berkeley

Robert Cohon, curator of antiquities, Nelson-Atkins Museum, Kansas City, PhD, Institute of Fine Arts, New York University

Morteza Sajadian, director, Museum of Art and Archaeology, PhD, University of Wisconsin

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 offers an MA degree with either a concentration or a minor in cultural heritage studies and historic preservation and, in association with the Museum of Art and Archaeology, a minor in museum studies.

Graduate students in both art history and archaeology are eligible for the Gregory Fellowships which carry a stipend of $5,000, and are supplemented by the department, as well as the G. Ellsworth Huggins Fellowships, which carry a renewable grant of $7,000 a year. The Gregory and the Huggins fellowships are awarded through a campuswide competition. Outstanding students also 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 teaching assistantships, which carry stipends up to $6,000 for half-time appointment, are available in either art history or archaeology.

Tuition fellowships are available to those holders of fellowships and assistantships who are liable for out-of-state tuition. These have application deadlines of February 1.

For more information, write the Director of Graduate Studies, Department of Art History and Archaeology, Columbia, Mo. 65211.

Of the limited number of persons admitted annually to the graduate programs, preference always is given to candidates for PhD degrees. Candidates must have a AB degree or its equivalent in art history, art, archaeology, classical languages or related fields of the humanities from a recognized institution. Applications accompanied by official GRE general test scores and three letters of recommendation should be submitted before February 1 for the following fall semester.

MASTER'S DEGREE: The master of arts degree qualifies the graduate for work in museums and for teaching positions in junior colleges.

The MA program in art history and in archaeology emphasizes a broad training through a diversification of courses. The minimum 30 credit hours must include 15 hours of 400-level courses, with no more than 12 hours of readings or special problems. Only after being admitted to candidacy may students take courses numbered 480 and 490.

A formal interview is required for admission to candidacy for the master's degree. In this interview the thesis proposal is discussed.

Application for an interview for candidacy may be made only after a student:

- fulfills the language requirements
- passes the qualifying examination
- decides on a specific field for the master's thesis with the assistance of an adviser of the individual's choice

Candidates must demonstrate in written language examinations a proficiency in reading German and French or Italian. A passing score in the ETS Foreign Language Examination normally fulfills this requirement. Students in classical archaeology are expected to have a reading knowledge of Greek or Latin in addition to German and French or Italian. The qualifying examination is given once each semester. This examination must be taken by the second semester of residence in which a student is taking courses for graduate credit. The student is expected to pass the examination no later than the third semester in residence. Students in art history must be familiar with key monuments of the art in the Western world, from Egypt to the present. For students in archaeology, a knowledge of key monuments of the ancient Near East, Egypt, Greece and Rome is required.

A thesis is required. The student must submit a draft 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.

Art
Art History and Archaeology

MA DEGREE WITH MINOR IN MUSEUM STUDIES: The graduate minor in museum studies, offered by the Museum of Art and Archaeology and the Department of Art History and Archaeology, provides students with a systematic introduction to the history, philosophy and the role of museums. The program blends academic theory with practical experience to provide students with an opportunity to build a foundation applicable in either university or public museums. The program comprises six graduate-level 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 (collections management and exhibition) and educational interpretation. Internships and field trips to local museums provide additional insight into the world of museum professionals. An individual course of study may be arranged with the program director. The minimum period required to complete the minor is three semesters, or two semesters and one summer. Courses are open to advanced undergraduate students, but admission to the program is open only to those who have completed a bachelor's degree.

All students who take museum studies courses as a minor are normally enrolled as graduate students in degree-granting academic departments. Successful completion of the program is accomplished through 12 credit hours of required course work, including a three-credit-hour internship, and is recognized when students successfully complete an MA in their academic field of study. ***Students should apply to the Director of the Museum of Art and Archaeology, 109 Pickard Hall, Columbia, Mo. 65211, for admission to the program.***

CULTURAL HERITAGE STUDIES AND HISTORIC PRESERVATION; MINOR AND CONCENTRATION: For students preparing for careers in cultural heritage studies, historic preservation, and related fields the Department offers two programs. The student may pursue an MA degree with a minor in cultural heritage studies and historic preservation or an MA or PhD degree with a concentration in the same fields.

For the MA or PhD degrees with a concentration in cultural heritage studies and historic preservation, the student will take, in addition to the requirements for the regular graduate degree, Historic Preservation 375 and collateral courses in history, anthropology or material culture, write a thesis on a topic in American Art, architecture or material culture, and complete an approved internship.

The graduate minor in cultural heritage studies and historic preservation offered by the Cultural Heritage Center 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 with practical field experience. It is an interdisciplinary program, drawing mainly on faculty and courses from the departments of art history and archaeology, history, environemtnal design, and textile and apparel management.

The program is complementary to the graduate minor in museum studies, which focuses on careers in museums of art and archaeology. Both graduate minors share general concerns for conservation and interpretation, but usually of quite different cultural materials. Students in cultural heritage studies and historic preservation, who are planning careers in historical museums, may find relevant curatorial and conservation courses through museum studies.

Curriculum: The program comprises at least 15 hours of approved course work. The required foundation course is historic preservation (Art History and Archaeology 375 or History 375), an interdisciplinary survey of the history, theory and state of the discipline. Also recommended are courses 374: Historic Preservation Methods and 365: American Architecture, or their equivalent. Other relevant courses are usually from the fields of history, environmental design, textile and apparel management, and anthropology. A list is published by the Cultural Heritage Center each semester to aid the student in selecting courses.

The student will also complete an internship in a relevant historic preservation agency or organization. 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. Individual courses are open to advanced undergraduate students, but admission to the program is open only to those who have completed a bachelor's degree.

Admission: All students who take cultural heritage studies and historic preservation as a minor are normally enrolled as graduate students in a degree-granting academic department at the University. Successful completion of the program is recognized at the time the student successfully completes an MA degree in his or her academic department. ***Students should apply to the Director of the Cultural Heritage Center for admission to the program.***

DOCTORAL DEGREE: For the PhD in both classical archaeology and art history, an MA is a prerequisite. However, one may apply for the PhD degree initially, in which case the department reserves the right to require an MA thesis be written. During the first semester at MU, students having MA degrees from other institutions must pass the department's qualifying examination. 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. Without the MA degree, 72 hours of course work are required, with the MA 48 hours are required.

A formal interview is required for admission to PhD candidacy and is granted only upon fulfillment of language and qualifying examination requirements and after a formal petition. 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 oral and written examinations.

The dissertation is expected to be an original contribution to scholarship in the field. The final examination, in the form of an oral defense of the dissertation, tests the candidate's knowledge of the special field.

COURSES

201—Topics in Art History and Archaeology (1-3). Selected studies in various facets of art history and archaeology. Prerequisite: departmental consent.

219—Near Eastern and Egyptian Art and Archaeology (3). Development of art and architecture of the Near East and Egypt in the Bronze Age.

220—Greek Art and Archaeology (3). General survey of development of material culture in Greece from earliest time to Hellenistic period. Prerequisites: 10, or General Honors 101, or History 102 or instructor's consent.

221—Roman Art and Archaeology (3). General survey of development of material culture in Roman world from earliest times through early empire. Prerequisites: 10, or General Honors 101, or History 102 or instructor's consent.

222—Ancient Technology (3). Engineering, architecture, military technology and astronomy in the ancient world. Prerequisite: sophomore standing.

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.

240—Early Medieval Art (3). Architecture, painting and sculpture of Europe from fourth century to beginning of Romanesque period. Prerequisites: 10, General Honors 102 or instructor's consent.

241—Late Medieval Art (3). Evolution of art and architecture in Europe from Charlemagne to 14th century as a result of the intellectual situation. Prerequisites: 10, General Honors 102 or instructor's consent.

250—Italian Renaissance Art (3). Architecture, painting and sculpture of Italy from the 14th century through the 16th century. Prerequisites: 11, General Honors 103 or instructor's consent.

251—Northern Renaissance Art (3). Evolution of art and architecture in Northern Europe from about 1400 to end of 16th century as a result of intellectual and historical situation. Prerequisites: 11 or equivalent, General Honors 103 or instructor's consent.

260—Baroque Art (3). European architecture, painting and sculpture of 17th century. Prerequisites: 11, General Honors 103 or instructor's consent.

261—Eighteenth Century European Art (3). 18th-century European painting, sculpture and architecture. Prerequisites: 11, General Honors 103 or instructor's consent.

270—Nineteenth Century European Art (3). 19th-century European painting, sculpture and architecture. Prerequisites: 11, General Honors 104 or instructor's consent.

271—Twentieth Century European Art (3). International directions in painting, sculpture and architecture from 1885 to the present, with special emphasis on development of abstract art in relation to other cultural factors. Prerequisites: 11, General Honors 104 or instructor's consent.

272—Twentieth Century American Art (3). Painting, sculpture and architecture, with special emphasis on responses to political and social concerns. Prerequisites: 11, 141, General Honors 104 or instructor's consent.

290—Honors Proseminar I (3). Introduction in research, individual reports and papers. Prerequisite: junior standing. Restricted to honors candidates and three-year MA program.

291—Honors Proseminar II (3). Continuance of 290.

292—Honors Reading and Research I (3). Individual research projects in preparation of senior thesis. Prerequisite: senior standing. Restricted to honors candidates and three-year MA program.

293—Honors Reading and Research II (3). Preparation of senior thesis. Prerequisite: 292.

300—Problems (cr. arr.). Special studies in art history/

archaeology covering subjects not included in regularly offered courses. Prerequisites: adequate preparation in either art history, archaeology, anthropology, classical languages, or history and instructor's consent.

301—Topics in Art History and Archaeology (cr. arr.). Special studies in art history/archaeology covering subjects not included in regularly offered courses. Prerequisites: adequate preparation in either 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. Prerequisite: 220 or instructor's consent.

309—Ancient Monumental Painting (3). Survey of art of painting and mosaics in Greek and Roman antiquity. Prerequisites: 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 General Honors 101 or equivalent.

311—Roman Sculpture (3). The origins and development of sculpture in the Roman Republic and Roman Empire. Prerequisite: 221 or instructor's consent.

312—Greek Architecture (3). Survey of art of building in Aegean and Classical world from earliest times to Hellenistic period. Prerequisite: 220, or General Honors 101 or equivalent.

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 third century after Christ. Prerequisite: 221 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, Humanities 101 or equivalent.

323—Greek and Roman Numismatics I (3) (same as Classical Studies 323). Coinage of Greek city-states, Roman Republic and Empire. Prerequisite: Greek 3 or Latin 3.

324—Greek and Roman Numismatics II (3) (same as Classical Studies 324). Coinage of Greek city-states, Roman Republic and Empire. Prerequisite: Greek 3 or Latin 3.

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 ninth century. Prerequisite: 240 or equivalent or instructor's consent.

341—Byzantine Art and Archaeology (3). Historical investigation of Byzantine material culture in east Mediterranean and Russia, from the outbreak of Iconoclasm to the Ottoman conquest. Prerequisite: 239 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.

350—Michelangelo and the High Renaissance (3). Sculpture, architecture, paintings and drawings of Michelangelo in the context of his times. Prerequisite: 250 or equivalent.

351—Renaissance and Baroque Architecture (3). Problems in European architectural history from the 14th century through the 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 socio-cultural relationship from the late gothic period to the 16th century in Europe, north of the Alps. Prerequisites: 241, 251 or equivalent.

353—Venetian Painting (3). Survey of Venetian painting from the 14th century through the 18th century. Prerequisites: 11, 250 or 260.

361—Rococo to Romanticism (3). Rococo through romanticism styles and issues in 18th-century art. Prerequisite: 261 or equivalent.

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.

373—Contemporary Art (3). International directions in painting and sculpture since World War II. Prerequisites: 141, 271 or Humanities 104.

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 nine hours.

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.

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.

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 (cr. arr.). 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 (cr. arr.). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisites: 309, 311, 313 or equivalent.

414—Ancient/Medieval Topography (cr. arr.). Descriptive and historical analysis of a selected city or site. Subject varies. Prerequisite: instructor's consent.

420—Seminar in Medieval Art and Archaeology (1-9). 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. Prerequisite: 341 or 343 or equivalent.

430—Seminar in Renaissance Art (3). Special subjects of study assigned in northern or southern Renaissance for individual research, discussion of reports by seminar members. Prerequisite: 350 or 352 or equivalent.

440—Seminar in Baroque Art (1-9). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisite: 260 or equivalent.

451—Seminar in Modern Art (cr. arr.). Special subjects assigned for individual research; discussion of reports by seminar members. Prerequisites: 270, 271 or equivalent.

452—Seminar in Modern Architecture (cr. arr.). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisite: 271 or equivalent.

453—British Art of the Eighteenth Century (3). Graduate lecture course. Special attention is given to social and historical contexts, theory, book illustration, garden architecture and caricature. Prerequisite: graduate standing.

454—Nineteenth Century Painting (3). Graduate lecture course. Special attention is given to Victorian painting, landscape, the development of abstraction and the concept of realism. Prerequisite: graduate standing.

460—Seminar in American Art (cr. arr.). Special subjects of study assigned for individual research; discussion of reports by seminar members. Prerequisite: 365 or equivalent.

470—Museum Studies (3). Lectures, fieldtrips and reports on the organization and operations of museums, collections-development, exhibitions, fundraising, educational outreach, public relations and ethics. Prerequisite: instructor's consent.

471—Curatorial Care of Collections (3). Lecture and laboratory course on preservation of objects. Prerequisite: advanced graduate standing or instructor's consent.

472—Museum Training (1-6). Internship in the Museum of Art and Archaeology or another approved museum. For students in museum training only. Prerequisite: advanced graduate standing.

480—Readings (cr. arr.). Reading, critical evaluation of literature of special fields of art history and archaeology. Prerequisite: 401 or equivalent.

490—Research and Thesis (cr. arr.). Individual research leading to preparation of thesis or dissertation. Prerequisite: 401 or equivalent.

Atmospheric Science

College of Agriculture, Food and Natural Resources
100 Gentry Hall 882-6591

FACULTY

Wayne L. Decker, chairman, director of graduate studies, professor, PhD, Iowa State University

Grant L. Darkow, professor, PhD, University of Wisconsin

Ernest C. Kung, professor, PhD, University of Wisconsin

Stephen E. Mudrick, associate professor, PhD, Massachusetts Institute of Technology

V. Rao Achutuni, adjunct associate professor, PhD, University of Oklahoma

Christopher W. Ratley, instructor, MS, Texas Technical University

DEGREES: MS and PhD in atmospheric science

Graduate programs are designed to prepare students for professional careers in research or teaching in the basic and applied aspects of atmospheric science. Because of the interdisciplinary nature of meteorology, study programs include course offerings of other departments, particularly those in the physical and mathematical sciences. Students with undergraduate education in atmospheric science, earth sciences, physics, mathematics, engineering, statistics or biology may be accepted for advisement.

Each graduate student is required to participate in one of the departmental research areas dynamical and physical meteorology, the general circulation, cumulus dynamics, statistical climatology and applied meteorology, the energetics of the general circulation, the dynamics of cumulus clouds and severe storms, biometerology with emphasis on the environmental impact on crop production and water utilization, the social and economic impact of climate variabilities, climatological expectancies and the mesoscale and macroscale dynamics of the free atmosphere.

The department has specialized computer data that support thesis and dissertation research

in microscale and large scale dynamical research, as well as computerized climatic data systems for use in solving applied meteorological problems. Graduate research is supported by the National Oceanic and Atmospheric Administration through the Cooperative Institute for Applied Meteorology at MU. There is an opportunity for joint programs with the Graduate Center for Cloud Physics at the University of Missouri-Rolla. MU is a member institution of the University Corporation for Atmospheric Research. Since UCAR manages the National Center for Atmospheric Research, graduate students and staff are involved with the programs of NCAR.

A limited number of fellowships, scholarships and graduate assistantships are available to qualified graduate students.

Those interested in applying should write the Director of Graduate Studies, Department of Atmospheric Science, 100 Gentry Hall, Columbia, Mo. 65211.

MASTER'S DEGREE: To be accepted for advisement in the MS program, a student's undergraduate degree program should include mathematics through integral calculus and at least one year of college physics. Additionally, an applicant should provide two references from faculty members and GRE scores.

At least 30 hours of graduate credit must be completed. A candidate must submit an acceptable thesis. A final examination covering the thesis and other graduate work completes the requirements. This examination may be oral, or written and oral, depending on the examining committee's recommendations. There is no language requirement.

DOCTORAL DEGREE: Students entering the doctoral program should have a master's degree or equivalent. A student with a master's degree from another institution is required to take a written qualifying examination.

The program of study is presented by the student and adviser to a doctoral program committee selected from the Department of Atmospheric Science and related areas. The committee is responsible for approval of a program of study and for identifying additional required academic or research related skills.

Candidates must pass the comprehensive examination and successfully complete a dissertation.

COURSES

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 a relevant problem. Prerequisites: upper-level standing, 50 or equivalent and instructor's consent.

301—Topics in Atmospheric Science (cr. arr.). Development of theory and applications for selected topics in atmospheric science. Prerequisites: junior standing and instructor's consent.

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.

304—Meteorological Analysis I (3). Basic techniques for surface and upper-air analysis, using selected examples of weather patterns. Prerequisites: 50, 350 or instructor's consent.

305—Meteorological Analysis II (3). Graphic analysis and interpretation of physical, kinematic and dynamic properties of the atmosphere. Analysis techniques applicable to atmospheric research. Prerequisite: 304 or equivalent.

307—Atmpsheric Phenomena in Physical and Earth (3). Description of atmospheric processes using lecture and simple laboratory activities for science teachers. Prerequisite: upper division or graduate standing.

314—Cloud and Precipitation Physics (3). Physics of atmospheric nucleation-condensation, cloud droplet, ice crystal growth, precipitation processes and associated electrical phenomena. Prerequisites: one year of physics and Mathematics 175.

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 and Physics 175.

356—Micrometeorology (3). Study of transport processes in the surface boundary layer. Important applications in pollution will be discussed. Prerequisite: 350.

366—Climates of the World (3) (same as Geography 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 man. Prerequisite: 50 or equivalent or graduate standing.

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 of atmospheric science and a 2.0 GPA.

392—Atmospheric Thermodynamics and Statics (5). Thermodynamics of dry and moist air, atmospheric hydrostatics, convection and development of the fundamental equations of geophysical fluid dynamics. Prerequisite: 350 or instructor's consent.

393—Atmospheric Kinematics and Dynamics (5). Dynamics and kinematics of atmospheric flow. Manipulation of fundamental equations, numerical modeling of atmosphere. Prerequisite: 392.

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 (cr. arr.). Independent study by graduate students 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: one year of physics and Mathematics 175.

410—Seminar (cr. arr.). Prerequisite: graduate standing.

412—Advanced Dynamic Meteorology (3). Application of perturbation dynamics, advanced dynamics and numerical methods to study of atmospheric circulations. Prerequisite: 393.

416—Atmospheric General Circulation (3). Comprehensive review of dynamical theories of general circulation with intensive discussion of current problems. Prerequisite: 393 or instructor's consent.

420—Meteorological Statistics (3). Applies theory of probability and frequency distribution to meteorological variables. Prerequisite: 350, or Statistics 320 or instructor's consent.

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, 416 or 366 or instructor's consent.

490—Research (cr. arr.). Research for thesis preparation.

Biochemistry

College of Agriculture, Food and Natural Resources
School of Medicine
117 Schweitzer Hall (314)882-4845

FACULTY

William R. Folk, chairman, professor, PhD, Stanford University

Judy D. Wall, director of graduate studies, associate professor, PhD, Duke University

Benedict J. Campbell, professor, PhD, Northwestern University

Milton S. Feather, professor, PhD, Purdue University

George B. Garner, professor emeritus, PhD, University of Missouri-Columbia

Charles W. Gehrke, professor emeritus, PhD, Ohio State University

Camilo A. Ghiron, professor, PhD, University of Utah

Thomas J. Guilfoyle, professor, PhD, University of Illinois

Richard Hillman, professor, PhD, Yale University

Roy O. Morris, professor, PhD, University College, London, England

Merle Muhrer, professor emeritus, PhD, University of Missouri-Columbia

Boyd L. O'Dell, professor emeritus, PhD, University of Missouri-Columbia

Beryl J. Ortwerth, professor, PhD, University of Missouri-Columbia

Edward E. Pickett, professor emeritus, PhD, The Ohio State University

Douglas D. Randall, professor, PhD, Michigan State University

R. Michael Roberts, professor, DPhil, Oxford University

Grace Y. Sun, professor, PhD, Oregon State University

Roger Sunde, professor, PhD, University of Wisconsin

Wynn Volkert, professor, PhD, University of Missouri-Columbia

Arnold A. White, professor, PhD, Georgetown University

Robert L. Wixom, professor, PhD, University of Illinois

Derek Cash, associate professor, PhD, Duke University

David W. Emerich, associate professor, PhD, University of Wisconsin

John M. Franz, associate professor, PhD, University of Iowa

Klaus Gerhardt, associate professor, PhD, Technical University at Berlin

Ingming Jeng, associate professor, PhD, University of California-Berkeley

Thomas Mawhinney, associate professor, PhD, Albany Medical College

Ezio A. Moscatelli, associate professor, PhD, University of Illinois

William D. Noteboom, associate professor, PhD, University of Illinois

Joseph Polacco, associate professor, PhD, Duke University

Francis J. Schmidt, associate professor, PhD, University of Wisconsin

David B. Shear, associate professor, PhD, Brandeis University

Warren L. Zahler, associate professor, PhD, University of Wisconsin

Creighton N. Cornell, assistant professor, DVM, University of Missouri-Columbia

Joseph Forrester, assistant professor, PhD, University of Missouri-Columbia
Gretchen Hagen, assistant professor, PhD, University of Georgia
Mark Hannink, assistant professor, PhD, University of California-San Diego
Mark Martin, assistant professor, PhD, University of Mississippi
Ruth McDonald, assistant professor, PhD, University of Minnesota
Virginia Peterson, assistant professor, PhD, University of Maryland
Mary Polacco, assistant professor, PhD, Duke University
Michael Riley, assistant professor, PhD, University of Kansas
Peter Tipton, assistant professor, PhD, University of Wisconsin
Gary Weisman, assistant professor, PhD, University of Nebraska

DEGREES: MS and PhD in biochemistry

COOPERATIVE DEGREES: MD/MS and MD/PhD in biochemistry

INTERDISCIPLINARY AREA PROGRAM: PhD in nutrition 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 composed of several departments within the College of Agriculture, Food and Natural Resources and the School of Medicine. This provides a great range of opportunities for multidisciplinary study in plant, animal and microbial biochemistry and molecular biology. Virtually every important area of biochemistry is represented by the research interests of the faculty. These focus upon plant biochemistry, hormonal control of plant and animal-cell metabolism, animal cell 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 principally in Schweitzer Hall and in the Chemistry and Medical Sciences buildings.

All students participate in individually planned research programs and have supervised teaching experience correlated with course work. Students are expected to complete a program of courses in biochemistry as well as selected courses in modern biology and chemistry.

Competitive fellowships are available each year.

For information and for application forms, write the Director of Graduate Studies, Department of Biochemistry, M121 Medical Science Building, Columbia, Mo. 65211.

MASTER OF SCIENCE DEGREE: Generally the master of science degree is awarded as part of the graduate program for a PhD degree. 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, one hour 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 a 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. Upon admission, the student will be advised of appropriate courses that must be satisfactorily completed to remedy deficiencies in entrance requirements. Satisfactory completion of a comprehensive examination is required by the end of the second academic year of graduate study.

The minimum departmental course requirements for the PhD are 12 hours of intermediate biochemistry 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, five credits in organic chemistry with laboratory. Recommended: quantitative analysis.

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.

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.

299—Seminar (1). Discuss journal papers dealing with current topics of research, techniques, status of field and importance of results. Students report on completed undergraduate research projects. Prerequisites: senior standing, a minimum of 10 hours of chemistry, including a biochemistry course with laboratory.

300—Problems (1-3).

304—General Biochemistry Lectures (3). Principles of biochemistry; studies bioconstituents and enzymes, coenzymes, metabolism, hormones and nutrition. Prerequisites: organic chemistry, quantitative chemistry and biology.

305—General Biochemistry (3). A continuation of 304, covering nucleic acids, molecular biology and metabolic regulation. Prerequisite: 304.

371—Enzymology and Metabolic Regulation (3). General concepts and experimental methods for study of the mechanism of enzyme action. Prerequisites: 270 and 272, or 304 or equivalents.

372—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.

399—Biochemistry/Biotechnology Information Retrieval (2). Consists of lectures, library trips, online searching and data analysis. Information will be retrieved from libraries and online data bases using computerized methodology. Areas include chemical structures, patents and analysis of macromolecules (RNA, DNA, proteins). Prerequisite: 270.

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.

403—Topics in Biochemistry (cr.arr.). Experimental courses, highly specialized topics taught infrequently or courses taught by visiting professors. Prerequisites: general biochemistry, other as specified by instructor.

405—Biochemical Methods in the Medical Sciences (4). In-depth laboratory on state-of-the-art methods in biomedical research. Prerequisites: 270 or 272 or equivalent.

410—Seminar (1). Review of current literature; individual presentation of research or classical science topics.

413—Reproductive Biology Seminar (1) (same as Animal Science 413). Presentation and discussion of selected topics from all phases of reproductive biology. Open to qualified students of graduate standing in the field of reproductive biology.

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: 270, 272 and 274, nutrition or instructor's approval.

422—Analytical Biochemistry Chromatography (2). Principles, experimental design, capabilities, limitations and applications of the general field of chromatography of biologically important molecules. Eight two-hour lectures, eight four-hour labs. Four weeks. Prerequisite: graduate standing or instructor's consent.

424—Analytical Biochemistry Mass Spectrometry (2). Instrumentation, fragmentation mechanisms, interpretation of spectra, combined gas chromatography — mass spectrometry. Eight two-hour lectures, eight four-hour labs. Prerequisites: two courses in organic chemistry, one course in physics and instructor's consent.

430—Biochemical Genetics (3) (same as Microbiology 430). Detailed examination of current fundamental concepts of molecular genetics of bacteria, bacteriophages and yeast. Experimental approaches to analysis of the physical structures of genomic nucleic acids, the biochemistry and genetics of mutations, replication, gene transfer and gene expression will be examined in depth from reports in the current literature. Biological Science 346 introduces many of the covered topics at a less advanced level.

431—Metabolic Regulation (3). This course is designed to give in-depth consideration of specific processes and mechanisms used to regulate metabolism. Prerequisites: 270 and 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.

440—Hormone Action (2). A lecture course with weekly assigned readings. Topics will include a description of selected polypeptide, steroids and other hormones and their biological effects; receptors; second messengers; protein phosphorylation in hormone mediation; growth factors; cellular oncogenes. Prerequisites: 270 and 272.

442—Receptor Biochemistry (1). Essential concepts in

receptor biochemistry are covered in depth to give students the information needed to appreciate recent advances in this rapidly expanding area of biochemistry. Students are encouraged to identify important problems and propose innovative approaches to solve them.

450—Research (2-8). Does not include preparation of dissertation.

465—Amino Acid and Protein Metabolism (2) (same as Nutrition 465). An advanced course on the animal metabolism of amino acids, peptides, proteins and nitrogen compounds with related enzymatic, hormonal and genetic control mechanisms and nutritional aspects. Prerequisites: 304, 305 or 270, 272 or equivalent. Human Nutrition 432 and Animal Science 402 are complementary.

469—Neurobiochemistry (3). 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: 270 and 272 or equivalent.

490—Research (cr. arr.). Research in biochemistry for qualified students, with counsel of faculty. Includes preparation of dissertation.

Biological Sciences

College of Arts and Science
105 Tucker Hall (314)882-6659

FACULTY

John D. David, director, associate professor, PhD, Vanderbilt University

Felix Breden, director of graduate studies, associate professor, PhD, University of Chicago

Gerald Summers, associate director, associate professor, PhD, University of Illinois-Urbana

Robert Breitenbach, professor emeritus, PhD, University of Wisconsin-Madison

Allan Burdick, professor emeritus, PhD, University of California-Berkeley

Billy G. Cumbie, professor, PhD, University of Texas-Austin

Roger M. deRoos, professor, PhD, University of California-Berkeley

Abraham Eisenstark, professor emeritus, PhD, University of Illinois

John Faaborg, professor, PhD, Princeton University

H. Carl Gerhardt, professor, PhD, University of Texas-Austin

Charles Gowans, professor emeritus, PhD, Stanford University

Arthur P. Harrison, professor emeritus, PhD, University of Maryland

Philip Jen, professor, PhD, Washington University-St. Louis

Clair Kucera, professor emeritus, PhD, Iowa State University

Dan Mertz, professor emeritus, PhD, University of Texas-Austin

Dean E. Metter, professor, PhD, University of Idaho

Donald Miles, professor, PhD, Indiana University

Donald L. Riddle, professor, PhD, University of California-Berkeley

George Smith, professor, PhD, Harvard University

William S. Stark, professor, PhD, University of Wisconsin-Madison

Fred vom Saal, professor, PhD, Rutgers University

Richard J. Wang, professor, PhD, University of Colorado

Joseph Wood, professor emeritus, PhD, Indiana University

Steven Alexander, associate professor, PhD, Brandeis University

James Birchler, associate professor, PhD, Indiana University

James E. Carrel, associate professor, PhD, Cornell University

Linda F. Chapman, associate professor, PhD, University of California-Los Angeles

Candace Galen, associate professor, PhD, University of Texas-Austin

Miriam Golomb, associate professor, PhD, University of California-Berkeley

Donald H. Hazelwood, associate professor, PhD, Washington State University

Joel Maruniak, associate professor, PhD, University of Texas-Austin

Kathy Newton, associate professor, PhD, Indiana University

Jack Twente, associate professor, PhD, University of Michigan

David L. Worcester, associate professor, PhD, Harvard University

Karen Cone, assistant professor, PhD, Duke University

Allan Harrelson, assistant professor, PhD, Rockefeller University

Timothy Holtsford, assistant professor, PhD, University of California-Riverside

Mark Kirk, assistant professor, PhD, Rice University

Andrew McClellan, assistant professor, PhD, Case Western Reserve University

Thomas E. Phillips, assistant professor, PhD, Northwestern University

Richard D. Sage, assistant professor, PhD, University of Texas-Austin

John Walker, assistant professor, PhD, University of Georgia

DEGREES: MA and PhD in biological sciences

General areas of research emphasis within the division include: ecology, evolution, systematics and behavior; genetic, cellular, molecular and developmental biology; neurobiology, physiology and behavior; and plant sciences. Within these general areas students may devise more specific graduate programs in, for example, plant physiology, invertebrate chemical communication, or neurophysiology. Several students are currently involved in established interdepartmental programs in neurosciences, genetics, plant biochemistry and physiology, cellular and molecular biology, 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 and the microbiology area 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, but deficiencies must be removed within the first year of graduate study. 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 deficiencies 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. In addition, non-resident tuition charges are waived for all students receiving financial support, and a number of divisional scholarships to cover the remaining tuition and fees are available. ***For more detailed information on stipend level and availability of various kinds of financial support, including university fellowships for superior students, write Director of Graduate Studies, 105 Tucker Hall, Columbia, Mo. 65211.***

The Division of Biological Sciences occupies 80,000 square feet of research and teaching space in Tucker Hall and Lefevre Hall, both of which are adjacent to buildings that house the chemistry and physics departments as well as 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 Research Center (Biological), the Nuclear Reactor, the Laboratory for Biological Control of Insects, the Columbia National Fisheries Research Laboratory, the State Cancer Research Center, the Environmental Trace Substances Research Center, the Eye Research Center, the Agricultural Experiment Station Laboratories and the Sinclair Comparative Medicine Research Farm for Studies in Chronic Disease and Aging.

In addition to the specialized equipment in each faculty research laboratory, departmental equipment and facilities available to graduate students include a Siemens Electron Microscope; 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 regulated light, temperature and humidity controls; animal-care facilities suitable for bats, rats, rabbits and birds; 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 in addition to 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 at least one 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 at least two courses in which the candidate will present a seminar. Candidates must satisfactorily complete a qualifying exam, 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 re-

quired to gain teaching experience by assisting a professor in one lecture/laboratory course for two semesters, sometime during their graduate training, regardless of their source of financial support. This normally requires two afternoons a week, and course assignments are made in consultation with the student and the student's adviser. Requirements for the PhD degree are generally completed in four or five years.

COURSES

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 and population genetics. Prerequisites: 10, Chemistry 11 and sophomore standing.

203—Introduction to Cell Biology (3). Study of structure and function at the cellular and subcellular level. Subjects include the physical chemistry of cellular processes, protein structure/function, metabolic regulation and membrane dynamics. Prerequisites: 10 and Chemistry 210, or equivalent, or concurrent enrollment in Chemistry 210.

204—General Entomology (3) (same as Entomology 204).

207—Plant Growth and Development (3). Introduction to growth and development of common cultivated plants. Emphasizes basic tenets of development that lead to better understanding of common cultivated plants. Prerequisites: 1, 10, or 12, Agronomy 30 and five hours of inorganic chemistry.

210—Parasitology (4). Parasitism is considered as a fundamental type of interspecies interaction. Principles of parasitism as they apply to animals are presented with emphasis on parasite morphology, biology and host-parasite relationships. Prerequisites: eight hours of biology.

212—Basic Microbiology (4). Principles of microbiology. Prerequisite: 203 or equivalent.

213—Comparative Anatomy of Vertebrates (5). Comparative study of organ-systems of a series of vertebrates. Prerequisites: 10 or 11.

214—Plant Taxonomy (4). Principles of classification of plants, use of keys and identification of local flora. Prerequisite: one year of biology.

222—Vertebrate Embryology (5). Compares basic patterns of development in vertebrates. Prerequisite: 10.

230—Invertebrate Zoology (5). Structure, ecology and phylogeny of the invertebrate phyla. Prerequisite: 10 or 11.

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.

250—Community Biology (3). Integrated set of lectures on evolution/population genetics, population dynamics/social systems and ecosystem structure/process, biomass in worldwide context and man in the environment. Prerequisites: 1, 10, 11 or 12 or equivalent.

266—Ornithology (4) (same as Natural Resources 266). Structure, identification, habits and importance of regional birds. Field work, lectures and lab. Prerequisites: five hours of biology or instructor's consent.

270—Vertebrate 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: 203.

293—Undergraduate Research in Biology (2-3). Individually directed field or laboratory research for upperclass students under faculty supervision. Project must be arranged by student and faculty member before registration. Prerequisites: overall GPA of 2.75, 20 hours of biology and/or chemistry and instructor's consent.

294—Undergraduate Research in Biology (2-3). Individually directed field or laboratory research for upperclass students under faculty supervision. Project must be arranged by student and faculty member before registration. Prerequisites: 293 and overall GPA of 2.75.

295—Honors Research in Biology (2-3). Special field or laboratory problems of experimental nature for upper-level honors students, in consultation with instructor. Prerequisites: overall 3.3 GPA, biological sciences honors program major and instructor's consent.

296—Honors Research in Biology (2-3). Continuation of research; preparation of honors report. Successful completion of report leads to degree with honors in biological sciences. Prerequisites: 295, overall 3.3 GPA.

300—Problems in Biological Sciences (cr. arr.). Individual supervised work to supplement regularly organized courses in biology and introduction to research. Prerequisites: upper-level standing and instructor's consent.

301—Topics in Biological Sciences (cr. arr.). Selected topics not in regularly offered courses. Prerequisite: instructor's consent.

302—Evolution (3). Surveys various processes in organic evolution and underlying genetic mechanisms. Prerequisite: 202.

303—Systematic Bacteriology (3). Systematics of bacteria with emphasis on their place in nature and their impact on humans. Prerequisite: 212 or equivalent.

307—Mycology (4) (same as Plant Pathology 307). Introduces the kingdom of fungi, primarily from morphological and systematic approach and is not restricted to plant pathogens. Laboratory and one field trip are required. Prerequisites: 202 or Agronomy 225 and instructor's consent.

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 and angiosperms. Prerequisite: 10 or 12.

309—Mammalogy (4) (same as Forestry, Fisheries and Wildlife 307). Taxonomy, distribution, structure, habits, importance of mammals; emphasizes those of central United States. Prerequisite: junior standing or instructor's consent.

310—Mammalian Adaptations (3). Biology of mammals on a topical basis; emphasis on reproduction, behavior and ecology. Prerequisites: five hours of biology, upper-level standing, Natural Resources 307 (Mammalogy) and Biological Science 342 (Behavioral Biology) recommended.

311—Ichthyology (4) (same as Natural Resources 311).

313—Plant Physiology (3-5). Modern physiology of higher green plants, using common cultivated plants as examples. May be taken with or without laboratory. Prerequisites: 10 or 12 and five hours of chemistry.

314—Agrostology (5). Identification of native grass flora. Five hours credit includes lectures, special assignments. Prerequisite: 10 or 12 or equivalent.

316—Principles of Insect Physiology (4) (same as Entomology 316).

321—Marine Biology (3). Marine organisms and their environment. Prerequisites: 10 or 11 or 230, five hours of chemistry, five hours of physics and junior standing.

324—Limnology (3-4) (same as Natural Resources 324).

325—Herpetology (4). The biology, ecology, taxonomy and distribution of amphibians and reptiles. Some Saturday field trips. Prerequisite: eight hours of biology or equivalent.

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 of physics.

328—Introductory Radiation Biology (3) (same as Nuclear Engineering 328, Radiology 328 and Veterinary Medicine and Surgery 328).

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 discussed to identify common mechanisms used by developing organisms. Prerequisites: 202, 203 and Chemistry 210.

332—Physiological Ecology (3-4). Relationship of physiological responses of organisms to their ecology; emphasizes different manifestations of a living system's ability to modify its properties in accord with environmental changes. Prerequisites: 203 or equivalent, a course in physiology and in ecology or instructor's consent.

333—Vertebrate Histology and Microscopic Anatomy (5). Microscopic anatomy of vertebrate tissues and organs. Prerequisites: junior standing and five hours of biology, 213 and 270, or equivalent training in anatomy or organismal biology, 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.

339—Neurobiology (3). Vertebrate and invertebrate neurobiology, including cell and molecular biology of the neuron, neurophysiology, neuroethology and developmental neurobiology. Prerequisite: 203 or 270 or instructor's consent.

340—Mammalian Cell Genetics (3). Recent advances in mammalian somatic and hybrid cell research and viral carcinogenesis. Prerequisite: 202 or equivalent.

341—Techniques of Neurobiology (4). 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.

345—Animal Communication (3-5). Physical properties of sensory stimuli, receptor mechanisms, functional significance of communication behavior, multidisciplinary and experimental approaches to current research in animal communication. Prerequisites: 203 and Physics 22 or equivalent.

346—Genetics of Microorganisms (3) (same as Microbiology 346). Lectures and readings in genetics of prokaryotic and eukaryotic microorganisms and microbial organelles. Prerequisites: 202 or equivalent and 212 or equivalent.

350—Special Readings in Biological Sciences (cr.arr.). Independent readings and discussion of topics in biology selected in consultation with supervising faculty member. Paper required. Prerequisites: senior or graduate standing in biology and instructor's consent.

354—Advanced Bacteriology (3-5). Discusses modern microbiology. Solvable questions posed by the instructor are answered by the student through independent experimentation. Techniques of molecular biology stressed. Prerequisites: 203 and 212 or equivalent.

360—Techniques in Cell Culture (4). Cultivation in vitro of tissue and cells from mammalian and other sources. Prerequisites: 203 or Biochemistry 270 or 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 may enroll for two hours of credit. Prerequisites: 10 hours in biology and junior standing.

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: two courses in biological science.

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, and 266.

370—Molecular Biology (3). Molecular mechanisms of DNA replication, mutation, recombination and gene expression in prokaryotes, eukaryotes and their viruses; gene fine structure and genetic engineering. Prerequisites: 202 and 203.

371—Cellular Physiology (5). The cell as a functional unit. Prerequisites: 10 hours of biology, five hours of physics and five hours of organic chemistry, some background in biochemistry or molecular biology is strongly recommended.

May be taken as lecture-only (three-hour credit) by graduate students or with instructor's consent.

374—Molecular Biology Laboratory (2). Emphasizes recently developed genetic and biochemical techniques; illustrates how they apply to contemporary problems in biological research. Prerequisites: 202 and Biochemistry 272 or concurrent registration in Biology 370.

384—Cytogenetics (3) (same as Agronomy 384).

385—Cytogenetics Laboratory (1) (same as Agronomy 385).

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 emphases. Prerequisites: biology major, senior standing, and instructor's consent.

400—Problems in Biological Sciences (cr. arr.). Research not expected to terminate in thesis, or individual advanced study in special subjects. Prerequisites: graduate standing and instructor's consent.

401—Topics in Biological Sciences (cr. arr.). Advanced topics not in regularly offered courses. Prerequisite: instructor's consent.

403—Physiological Responses to Environment (3) (same as Forestry, Fisheries and Wildlife 403). Changes induced in plants by variations in temperature, water and light. Prerequisite: 313 or equivalent.

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 and graduate standing.

409—Plant Morphogenesis (2). Reading, discussion and reports based on world's literature dealing with analysis of factors involved in development of plants from time of inception to adult form. Prerequisite: 308 or equivalent.

410—Seminar (1). Current topics in the biological sciences. Open to all graduate students. Offered S/U. Prerequisite: graduate standing.

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 and instructor's consent.

414—Photosynthesis Lecture (2). Discussion of structure, organization, control and biochemical, and biophysical processes of photosynthesis with emphasis on light reaction. Prerequisites: a course in biochemistry and a course in plant physiology.

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.

420—Endocrinology (3) (same as Dairy Science 420).

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.

423—Genetics of Populations (4) (same as Animal Science 423).

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.

430—Speciation (2). Discussion of factors involved in the process of speciation with an emphasis on macroevolution. Prerequisites: 202 and 214.

431—Cell Biology I (3). Survey of chromosome structure and production of RNA and protein gene products through critical review of research papers. Prerequisites: 202 and 302.

432—Advanced Cell Biology (4). Prerequisites: 203, graduate standing, and instructor's consent.

435—Cellular Basis of Development (3). Critical examination of the literature in specific areas of development and morphogenesis. Attention is focused on cellular interactions and pattern formation. Prerequisites: 202, 203 and instructor's consent.

441—Neurobiological Techniques (4). Principles and techniques of experimental neurobiology. Participants will complete an independent research project. Prerequisites: 270 or 339 or consent of instructor.

450—Non-thesis Research (cr.arr.). Independent research not leading to a thesis. Prerequisites: graduate standing and instructor's consent.

490—Research in Biological Sciences (cr.arr.). Research leading to thesis or dissertation. Prerequisites: graduate standing and instructor's consent.

Black Studies Area

318 Arts and Science (314)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 Afro-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 designated to assist in this matter. In the absence of other information, students should contact the director of graduate studies.

Business Administration

College of Business and Public Administration
303D Middlebush (314)882-2750

FACULTY

Bruce J. Walker, dean, professor of marketing, DBA, University of Colorado

Robert V. Penfield, associate dean, associate professor of management, PhD, Cornell University

E. Allen Slusher, associate dean, director of graduate studies, professor of management, PhD, University of Iowa

Everett E. Adam Jr., professor of management, PhD, Michigan State University

Earl A. Cecil, professor of management, DBA, Indiana University

Ronald J. Ebert, professor of management, DBA, Indiana University

Donald S. Holm Jr., professor of management, treasurer to the Board of Curators, PhD, Indiana University

Richard H. Pettway, professor of finance, Missouri Bankers Chair, director of financial research institute, PhD, University of Texas

Robert D. Schooler, professor of marketing, PhD, University of Texas

John D. Stowe, director of School of Business, professor of finance, chairman, 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

Don R. Webb, professor of marketing, PhD, University of Illinois

David A. West, professor of finance, PhD, University of Arkansas

Albert R. Wildt, professor of marketing, Bailey K. Howard World Book Professor, PhD, Purdue University

Allen C. Bluedorn, associate professor of management, PhD, University of Iowa

Thomas W. Dougherty, associate professor of management, PhD, University of Houston

Charles R. Franz, associate professor of management, PhD, University of Nebraska

Lori S. Franz, associate professor of management, PhD, University of Nebraska

Charles J. Corrado, assistant professor of finance, PhD, State University of New York-Albany, PhD, University of Arizona

Brad D. Jordan, assistant professor of finance, PhD, University of Florida

Susan D. Jordan, assistant professor of finance, PhD, University of Georgia

Yul W. Lee, assistant professor of finance, PhD, University of Texas

Granger Macy, assistant professor of management, PhD, Indiana University (pending)

Ajay Patel, assistant professor of finance, PhD, University of Georgia

Lisa Scheer, assistant professor of marketing, PhD, Northwestern University

William R. Smith Jr., assistant professor of marketing, PhD, University of North Carolina (pending)

Paul Swamidass, assistant professor of management, PhD, University of Washington

Daniel Turban, assistant professor of management, PhD, University of Houston

DEGREES: MBA and PhD in business administration

COOPERATIVE DUAL DEGREES: MBA and MHA, MBA and MS in industrial engineering

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. A master's candidate will select advanced course work from the offerings of these departments. A PhD candidate selects one of the departments as the area in which to concentrate course work and write a dissertation. The School of Business faculty is housed in Middlebush Hall. In addition to an auditorium, classrooms and office space, Middlebush Hall also contains a computer lab staffed by consultants. Thirty-two terminals access the university mainframe (an IBM 4381 VMCMS environment) 24 hours a day most of the year. Thirty-one IBM PCs, along with the latest in computer software, also are available. In addition, students have access to the resources of the B&PA Research Center and Ellis Library.

THE MBA DEGREE is designed for superior graduate students whose primary interest is preparation for managerial careers in business. It 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 the essential unity and interrelation of all business operations, 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. Undergraduate GPA and performance on the Graduate Management Admissions Test (GMAT) are the prime factors considered in acceptance for advisement. In exceptional cases, work experience, motivation and maturity are taken into consideration. An international student whose native language is not English is required to present a minimum score of 575 on the Test of English as a Foreign Language (TOEFL). Both the GMAT and TOEFL are administered by the Educational Testing Service.

Total graduate course work necessary to qualify for the MBA degree may vary from 39 to 63 semester hours, depending upon the nature and quality of a student's undergraduate preparation. The first year of the program consists of a series of graduate foundation courses, which draw upon subject matter normally covered in undergraduate courses in business and related disciplines. However, the scope and method of coverage is more demanding and is directed toward the mature graduate student. A foundation course may be waived for a student whose undergraduate record indicates courses covering substantially the same materials have been completed.

First-year courses total 36 hours of work in the following subjects: calculus, organization theory and behavior, accounting, computer programming, statistics, micro-macro economics, operations management, finance, marketing and decision science.

The second year of the program requires at least 27 hours, 39 hours if all core courses are waived. In addition to required courses in management, finance and marketing, each student must complete an area of concentration in one of the following: general management, finance, human resource management, management of information systems, marketing or operations management.

Not more than six hours of advanced work may be transferred toward the second year requirements from another university, and that university must be accredited at the master's level by the American Assembly of Collegiate Schools of Business.

The MBA degree does not require a thesis or a language, but a number of second-year courses emphasize research projects and analytical reports.

Limited financial assistance from research and teaching assistantships is available. These assistantships are usually quarter-time appointments involving 10 hours of work a week at approximately $3,000 annually. Holders of assistantships waive all tuition charges.

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.

THE DOCTORAL DEGREE in business administration is designed to provide:

- a broad understanding of the major areas of business; the role of the business manager as analyst, planner and decision maker; the mutual dependence between the firm and its environment
- intensive preparation for teaching in a specialized area at the college or university level with emphasis upon the dynamics of the discipline
- competence for original research and awareness of the importance of self-development and scholarly growth

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 students' 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. Formal admission to the PhD program in business administration requires satisfactory performance on a doctoral qualifying examination taken during the students' first semester of study.

During the first semester of course work, students must arrange with a member of the doctoral faculty from their major area of study to serve as chairman of a doctoral program committee. This committee, appointed after student/faculty consultation, consists of five members, with a minimum of three members from the students' major area of study and a minimum of one member from each of the students' supporting areas of study. The program committee conducts the qualifying examination and works with the students' to design a program of study.

All programs of study must include the four groups of requirements listed below:

- 15 hours of specific MBA course work must be taken unless waived based on previous course work
- concentration of 15 hours of 400-level courses in the area of finance, management or marketing
- two supporting areas of at least nine hours each, one that must be taken outside the School of Business
- a 15-hour collateral, emphasizing the analytical tools for business. Proficiency in a foreign language does not fulfill the collateral requirements. Courses in the collateral are in addition to those listed above, and must include Business Administration 481 and a 12-hour mathematical statistics/quantitative sequence approved by the director of graduate studies.

These four groups of requirements are independent of each other; courses taken to satisfy one may not be used to satisfy any other. Graduate work taken before admission to the PhD program may be used to satisfy these requirements if approved by the program committee.

Oral and written comprehensive examinations covering the major area and the supporting areas are administered after the candidate has completed all course work of the official study program. A doctoral dissertation, for which a student earns a minimum of 12 hours and a maximum of 24 hours of credit, is required of each candidate. A final oral examination is held at the completion of the dissertation, and is concerned primarily with the research accomplished by the student while writing a dissertation.

If more than four years elapse between the time the student satisfies the comprehensive examination committee requirements and completion of the dissertation, both written and oral comprehensive examinations must be retaken.

Limited financial assistance through research and teaching assistantships is available. These assistantships are usually half-time appointments involving approximately 20 hours of work a week and range from $6,000 to $9,000 annually. Holders of assistantships waive all tuition charges.

Applications and additional information about the doctoral program may be obtained by writing the Director of Graduate Studies, School of Business, Middlebush Hall, Columbia, Mo. 65211.

COURSES

301—Organization Theory and Behavior (3). Organization theory; study of relationships among individuals, groups and units in organizations and the systems which facilitate organizational goal achievement.

320—Computer Applications for Planning and Decision Making (3). Introduction to computer programming for administrative uses, including management information systems for facilitating organizational operations.

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, 324 and Mathematics 205.

342—Production/Operations Management (3). Surveys problems common to operations within a complex organization. Emphasizes planning, control and decision making. Prerequisites: 320 and 324 or instructor's consent.

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: 320 and Accountancy 316 or instructor's consent.

346—Managerial Marketing (3). Analysis and control of an integrated marketing program, with special emphasis on prices, products, promotion and channels of distribution.

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 field research may supplement published materials.

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. Prerequisite: PhD 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: PhD status or instructor's consent.

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. Prerequisite: PhD standing or instructor's consent.

Chemical Engineering

College of Engineering
1030 Engineering Building (314)882-9603

FACULTY

Dabir S. Viswanath, chairman, Dowell professor, PhD, University of Rochester

David G. Retzloff, director of graduate studies, associate professor, PhD, University of Pittsburgh

Anthony L. Hines, dean, Lloyd & Margaret Ketchum Professor, PhD, University of Texas

Paul C. H. Chan, director of undergraduate studies, associate professor, PhD, California Institute of Technology

Richard H. Luecke, professor, PhD, University of Oklahoma

Truman S. Storvick, professor, PE, PhD, Purdue University

H.K. Yasuda, Dowell professor, director, Surface Science and Plasma Technology Center, PhD, Syracuse University

Rakesh K. Bajpai, associate professor, PhD, Indian Institute of Technology-Kanpur

Thomas R. Marrero, associate professor, PhD, University of Maryland

Nilufer H. Dural, assistant professor, PhD, University of Missouri-Columbia

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 in the general section under **Professional Engineering Registration.** Areas of study in the department are non-ideal fluid mechanics, rheology, process control and optimization, reaction kinetics, catalysis, system dynamics, bio-oxidation, Newtonian fluid mechanics, applied mathematics to chemical engineering problems, mass transport (vibrating and non-vibrating systems), thermodynamics, transport properties of gases, heat and mass-transfer, high-pressure properties of liquids and gases, plasma-processing research, biologically oriented engineering research, air pollution monitoring and control, energy resource and reproduction, and biochemical engineering research.

Research students have use of excellent facilities, 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 non-Newtonian fluid mechanics laboratory; computational laboratory; and a transport properties phenomena laboratory. Excellent library facilities provide the latest domestic and foreign 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 is approximately $7,600, and waives all non-resident fees and at least two-thirds of the resident educational fee. Industrial fellowships of $500 also are available to students who do not qualify for assistantships. These fellowships are awarded for the academic year and allow for non-resident fee remission.

The half-time appointment permits 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 in many cases 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 usually 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. If the test is not taken before entrance, it must be taken the first semester of residence.

An individual program of a minimum of 30 semester hours is required and program includes seminars, advanced courses in chemical engineering, physical and chemcial sciences, mathematics and not more than 12 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 and related topics. Prerequisites: Physics 176, Chemistry 210 and Mathematics 304 or concurrently.

234—Principles of Chemical Engineering I (3). Fluid flow, heat transfer. Prerequisite: 225 or Engineering 99.

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.

261—Chemical Engineering Thermodynamics I (3). Study of thermodynamics, with particular reference to chemical engineering applications. Prerequisites: 225 or Engineering 99.

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 and Nuclear 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—Engineering Analysis (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). Chemodynamics which concerns with environmental movement of chemicals in air, water and soil is designed to introduce students to the basic principles and techniques useful for the predication of the movement and fate of chemicals in ecosystems. Prerequisite: 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. Prerequisite: 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 unit 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 and Chemistry 212.

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 that leads 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) (same as Mechanical and Aerospace Engineering 379 and Nuclear Engineering 379). Introduction to natural and engineered particulate systems. Prerequisite: 234, or Mechanical and Aerospace Engineering 299 or equivalent.

385—Chemical Engineering Design I (3). Design and layout of chemical plants and equipment. Prerequisites: senior standing in chemical engineering, 235, 262 and 304.

387—Process Analysis and Simulation (3). Mathematical analysis and modeling of chemical processes; optimization during process design and operation. Prerequisites: 304 and 385.

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 and 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, and Mechanical and Aerospace Engineering 357 or instructor's consent.

410—Seminar (1). Reviews investigations and projects of importance in chemical engineering.

420—Advanced Heat and Momentum Transfer (3). Advanced study of these transport phenomena. Prerequisites: 235 and 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: 235.

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 (cr. arr.). Independent investigation in chemical engineering, to be presented as a thesis.

Chemistry

College of Arts and Science
123 Chemistry Building (314)882-8374

FACULTY

Elmer O. Schlemper, chairman, professor, PhD, University of Minnesota

John E. Bauman Jr., director of graduate studies, associate chairman, professor, PhD, University of Michigan

Edwin M. Kaiser, professor, PhD, Purdue University

S. R. Koirtyohann, professor, PhD, University of Missouri-Columbia

Robert R. Kuntz, professor, PhD, Carnegie Institute of Technology

Richard N. Loeppky, professor, PhD, University of Michigan

Stanley E. Manahan, professor, PhD, University of Kansas

John P. McCormick, professor, PhD, Stanford University

Patricia L. Plummer, professor, PhD, University of Texas

Richard C. Thompson, professor, PhD, University of Maryland

Tuck C. Wong, professor, PhD, University of Michigan

John E. Adams, associate professor, PhD, University of California

William H. Bunnelle, associate professor, PhD, University of Chicago

Robert E. Harris, associate professor, PhD, University of California

Jerome W. O'Laughlin, associate professor, PhD, Iowa State University

Paul R. Sharp, associate professor, PhD, Massachusetts Institute of Technology

Rainer Glaser, assistant professor, PhD, University of California-Berkeley

C. Michael Greenlief, assistant professor, PhD, University of Texas-Austin

Michael Harmata, assistant professor, PhD, University of Illinois-Urbana

Sylvia Jurisson, assistant professor, PhD, University of Cincinnati

Shubhender Kapila, adjunct professor, PhD, Dalhousie University

J. Steven Morris, adjunct professor, PhD, University of Missouri-Columbia

Fred K. Ross, adjunct professor, PhD, University of Illinois-Urbana

DEGREES: MS and PhD in chemistry

INTERDISCIPLINARY DEGREE: MS in physical science

The department offers areas of concentration in analytical, inorganic, organic, physical and radiopharmaceutical chemistry, 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, mass spectrometers and GC-FTIR spectrometer are located in the Chemistry Building. The department maintains a radiochemical research lab at the Reactor Facility and shares in state-of-the-art analytical equipment at the Environmental Trace Substances Research Center. Other campus facilities widely used by the department include a central instruments shop, glass blowing shop, electronics shop, campus computing center and a 10-megawatt nuclear reactor. The latter provides a high neutron flux for radioisotope and activation analysis and for neutron diffraction.

Fellowships, teaching and research assistantships are available for highly qualified applicants. Application forms, which may be obtained from the department chairman, should be submitted no later than April 1 of each year.

INTERDISCIPLINARY PROGRAM: The department, along with the departments of physics and mathematics, also offers graduate work leading to the degree of master of science in physical science. Designed for those planning to teach in community colleges, this degree requires 40 semester hours of course work and no thesis.

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 in the 70th percentile of 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 possible qualifying examinations. A student who performs well, as determined by the departmental graduate program committee, on any of the four divisional examinations will be considered to have qualified in that division and will not be required to take the core course(s) for 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 no later than 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 eight 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 to students in analytical and organic chemistry. All students write a research proposal on a topic approved by their committee. The proposal is defended before a committee.

The comprehensive exam is concluded by an oral exam stressing the major field but with some questions from related areas of chemistry.

The candidate must submit a dissertation describing the results of successful and original research in one of the branches of chemistry. After the dissertation has been accepted, there is a final oral examination, primarily in the field of the candidate's research.

COURSES

210—Organic Chemistry (3). First course of a sequence. Concentrates on fundamentals and applies them to a few

functional groups. Only one hour of credit if student has completed 115 or equivalent. Prerequisites: 11 and 12 or equivalent.

211—Organic Chemistry Laboratory (2). Must accompany or follow, cannot precede 210.

212—Organic Chemistry (3). Continuation of 210. Covers carbonyl-containing compounds, amines, heterocycles, natural products (fats, carbohydrates, amino acids, proteins, nucleic acids) and others. Prerequisite: 210 or departmental consent.

213—Organic Chemistry Laboratory (2). Must accompany or follow, cannot precede 212.

221—Quantitative Instrumental Analysis (4). Introductory course for non-majors. Stresses chemical analysis, including the basic principles of modern instrumental methods. Prerequisite: 12.

223—Quantitative Chemical Analysis (4). Extensive treatment of principles and practice of quantitative analysis and separations. For chemistry and other science majors. Prerequisite: 12.

230—Physical Chemistry for Life Science (3). Satisfies physical chemistry prerequisite for Biochemistry 320 and 322. Prerequisites: Mathematics 175, a course in organic chemistry, Physics 11, 12 or 175 and 176 or 176 concurrently.

231—Physical Chemistry (3). Lecture only. Topics include the kinetic theory of gases, chemical kinetics, thermodynamics and chemical equilibrium. Prerequisites: one semester of organic chemistry, one year of college physics and Mathematics 201 or 201 concurrently.

233—Physical Chemistry (3). Continuation of 231. Lecture only. Covers wave mechanics, bonding, molecular spectroscopy and statistical mechanics.

234—Physical Chemistry Laboratory (3). Normally concurrent with 233. Prerequisite: 221 or 223 with a C or better.

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 approval of the department chairman.

270—Professional Tools for Chemists (2). Introduction to the chemical literature and to the formal presentation of chemical information; overview of the chemical profession and issues facing chemists. Extensive writing will be required. Prerequisite: 210.

280—Internship in Chemistry (1-6). Cannot be substituted for other chemistry courses required for BS or AB 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.

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.

301—Topics in Chemistry (cr. arr.). 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.

310—Trace Analysis (3) (same as Biochemistry 310).

312—Instrumental Methods of Analysis (4) (same as Biochemistry 312). Chemical instrumentation methods including electrochemistry, spectroscopy and advanced separation techniques. Prerequisites: 223 and 231 concurrently.

316—Synthetic Organic Chemistry (3). Stresses synthetic-organic chemistry. Prerequisite: one year organic chemistry.

321—Intermediate Analytical Chemistry (2). Principles of separations, equilibrium and other advanced topics in analytical chemistry. Enrollment confined to graduate students in chemistry. Prerequisite: 312.

329—Environmental Chemistry (3). Surveys the chemistry of air and water environments and discusses the chemistry of waste treatment. Prerequisite: 18 hours of chemistry, including organic and 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.

332—Chemical Thermodynamics (3). Review of classical thermodynamics and statistical thermodynamics; applications to chemical and phase equilibrium in ideal and non-ideal systems. Prerequisite: 233.

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.

335—Nuclear Chemistry (3). Studies nuclear reactions and properties of products of those reactions. Prerequisite: 233.

341—Inorganic Chemistry (3). Atomic and molecular structure, bonding, kinetics and mechanism, ligand field theory, coordination compounds, acids and bases. Prerequisite: one semester of physical chemistry, second semester co-requisite.

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 radioactive-tracer techniques to chemical research. Prerequisites: course in quantitative analysis or instructor's consent.

401—Topics (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisite: instructor's consent.

409—Chemistry of Natural Products (3). Studies shikimates, acetogenins, terpenoids, steroids, alkaloids and drugs. Emphasis on biogenesis and relevant chemistry.

410—Seminar (1).

411—Organometallics (3). Condensations affected by organometallics, dissolving metal reductions, sandwich compounds and related organotrasition metal derivatives.

412—Physical Organic Chemistry I (3). Bond theory, physical methods, absorption spectroscopy, conformational analysis and 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: one year of organic chemistry and physical chemistry.

416—Organic Spectroscopy (3). Structural analysis of organic compounds, involving problem solving and using modern NMR, 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 of graduate organic chemistry.

419—Physical Organic Chemistry II (3). Case studies and methods for determining organic reaction mechanizing.

423—Separations and Chromatography (3). Classical and instrumental methods of separation gas, paper, thin film, column chromatography and ion exchange.

425—Advanced Analytical Chemistry I (3). Selected topics dealing with recent advances in analytical chemistry.

427—Advanced Analytical Chemistry II (3). Continuation of 425.

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.

432—Chemical Kinetics (3). Factors affecting rates, orders and mechanisms of chemical reaction, with emphasis on current theories and experimental techniques.

433—Atomic and Molecular Structures (3). Introduces molecular symmetry and eigenvalue problems; quantum mechanical treatment of topics selected from molecular vibration and notation, electronic structure and spectra, crystal field theory, magnetic resonance, theory of solids. Prerequisite: 233 or equivalent.

435—Magnetic Resonance (3). Basic principles of nuclear magnetic resonance (NMR) and electron spin resonance (ESR), nuclear spin relaxation, current experimental techniques and their application to studies of structures, dynamics and chemical analysis. Prerequisites: 212, 233 or equivalent.

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.

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 (cr. arr.). Does not lead to dissertation.

461—Advanced Radiochemistry (3). Reviews current advances in radiochemistry, hot atom chemistry, radiation chemistry, nuclear spectrometry. Prerequisite: 361 or equivalent.

490—Research (cr. arr.). Research leading to thesis.

Civil Engineering

College of Engineering
1047 Engineering Building (314)882-6269

FACULTY

James W. Baldwin Jr., chairman, professor, PhD, University of Illinois

Jay B. McGarraugh, associate chairman, professor, PhD, Purdue University

Shankha K. Banerji, director of graduate studies, professor, PhD, University of Illinois

Neal B. H. Benjamin, professor, PhD, Stanford University

Richard T. Douty, professor, PhD, Cornell University

Charles W. Lenau, professor, PhD, Stanford University

Henry Liu, professor, PhD, Colorado State University

John T. O'Connor, professor, EngD, Johns Hopkins University

Harold J. Salane, professor, PhD, University of Texas

Thomas E. Clevenger, associate professor, PhD, University of Missouri-Columbia

David L. Guell, associate professor, PhD, Northwestern University

Mark R. Virkler, associate professor, PhD, University of Virginia

Brett W. Gunnink, assistant professor, PhD, Iowa State University

Vellore S. Gopalaratnam, assistant professor, PhD, Northwestern University

R. Lee Peyton, assistant professor, PhD, Colorado State University

Clifford J. Roblee, assistant professor, PhD, University of Texas

DEGREES: MS and PhD in civil engineering, MS in sanitary engineering

Information on engineering licensure is detailed under **Professional Engineering Registration.**

Specific programs of study have been developed in six areas

- structural engineering-structural mechanics, analysis and design, soil mechanics and foundations, emphasis on advanced aspects of structural behavior
- sanitary and environmental engineering-principal emphasis on water pollution control, water purification, waste water treatment, the disposal of residues from these processes and hazardous and solid waste management options. Concentrates on the application of physical, chemical and microbiological principles to design for water supply and pollution control facilities.
- construction planning and management-course work integrating a combination of business administration, cost accounting and economics tailored to the needs of the construction engineer or manager
- transportation and urban systems engineering-emphasis on course work ranging from highway and pavement design to land use planning and the development of advanced transportation systems for urban areas
- hydraulic engineering, hydrology and water resources planning and management-combines classical hydraulic design with systems analysis and optimization techniques for enhanced planning of large scale water resources systems. Emphasis is given to the social, political and regional economic effects of large-scale water projects
- municipal and public works engineering-designed for engineers who plan to work in urban administration and management, broad in scope and oriented toward legal and political administration, cost management regulation and enforcement for environmental control

The department has well-equipped laboratories for experimental research in structures, sanitary (environmental) engineering, soil mechanics and fluid mechanics. The structural laboratory contains closed-loop-servo- controlled hydraulic loading apparatus and automatic data acquisition equipment. The environmental engineering laboratories are equipped with analytical equipment for the complete chemical and biological analysis of water and wastewater. A separate sanitary engineering laboratory building, adjacent to the nuclear reactor facility, is used for pilot plant testing and larger scale studies related to hydraulic engineering, water purification, wastewater treatment and pollution control.

In addition to the fellowships and traineeships supported by NSF, EPA and other governmental agencies, approximately 10 graduate research and teaching assistantships are available each year. Half-time appointments pay $7,500 a year for MS students, and permit the recipient to take 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, Department of Civil Engineering, 1047 Engineering Building, Columbia, Mo. 65211.

MASTER'S DEGREE-THESIS AND NON-THESIS OPTION: An applicant with a BS degree in engineering from an ABET accredited program and an undergraduate GPA of at least 3.0 or the equivalent (A=4.0) during the last two years of undergraduate work may be accepted for advisement in the program leading to the MS in civil engineering. Candidates for the MS in sanitary engineering can have a BS degree in the physical or biological sciences. Non-engineers may be required to make up certain program deficiencies.

The GRE must be taken before admission or during the first semester of enrollment.

Each master's program requires a minimum of 30 credit hours, a minimum of 15 hours of this credit must be in courses at the 400 level. At least one week before the final oral examination, a candidate must submit to an examining committee a thesis, a formal report or a design of professional quality that applies 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. The final oral examination is required of all master's candidates.

DOCTORAL DEGREE: Formal acceptance to candidacy for the PhD degree 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 committee may conduct an oral qualifying examination concurrently with the final examination for the master's degree.

PhD programs are committee administered and tailored to fit the needs of each individual student. Specific requirements are held to a minimum of two years of course work and one year of research beyond the bachelor's degree. One year of credit is given for the MS degree, and the second year comprises approximately 30 credit hours of additional course work. The candidate must pass a comprehensive examination and submit and defend a dissertation at a final oral examination.

COURSES

212—Transportation Systems Engineering (3). Studies engineering characteristics of various modes of transportation of passengers and goods. Prerequisite: 113.

221—Structural Analysis (4). Analysis of statically determinate beams, frames and trusses; shear and moment diagrams; influence line diagrams; beam deflections. Analysis of statically indeterminate structures; moment distribution; energy methods. Introduction to matrix analysis. Prerequisite: 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. Prerequisite: 221.

232—Civil Engineering Materials (3). Introduces composition, structure, properties, behavior and selection of civil engineering materials. Prerequisite: Engineering 195 or instructor's consent.

241—Fluid Mechanics Laboratory (1). Applications and demonstration of basic principles of fluid mechanics by experiment. Prerequisite: 251.

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.

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.

276—Aerospace Structures I (3) (same as Mechanical and Aerospace Engineering 276). Analysis and design of aerospace structural components and structures. Prerequisites: Engineering 195 and Mathematics 304.

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.

313—Advanced Surveying (3). Celestial observations for determination of position; state coordinate systems, precise surveys, introduction to geodetic surveys, principles of photogrammetry. Theory of optical surveying instruments. Prerequisites: 113 and Mathematics 80.

314—Property Boundary Location (3). Principles of real property ownership, deeds, property boundary surveying, legal principles of original and retracement surveys, Missouri statutes and regulations affecting surveying, GLO corner restoration and re-establishment. Prerequisites: 20 or 113.

323—Structural Design II (3). Design of building structures and bridges in steel and reinforced concrete, using case studies. Prerequisites: 222 and 223.

324—Structural Design and Analysis(3). Design and analysis of building frames and bridges in steel and concrete, using case studies. Economic selection of structural type and material. Basic methods of analysis for statically indeterminate structures. Prerequisite: 323.

325—Energy Methods in Mechanics (3) (same as Mechanical and Aerospace Engineering 325). Design of building structures and bridges in steel and reinforced concrete, using case studies. Prerequisites: 222 and 223.

326—Structural System Design (3). Design of structures using prefabricated elements. Economic considerations for system selection. Design and analysis of connection details. Case studies of modular structural systems. Prerequisite: 323.

331—Prestressed Concrete (3). Principles of prestressing, constituent materials and code provisions. Working and ultimate stress analysis and design, shear and torsion. Deflections. Prestress losses. Continuous beams, indeterminate structures. Compression members, combined loading. Co-requisite: 222.

340—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.

341—Hydrology (3). Fundamental concepts of hydrology in engineering; quantitative estimation of stream-flow magnitude and frequency. Prerequisite: Mathematics 201.

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: 341 and 251 or instructor's consent.

344—Analysis of Water-Resource Systems (3). Applies hydrology, hydraulic and sanitary engineering and economics to water-resource design problems considering man and his environment. Uses methods of systems analysis. Prerequisite: 340, 341 or instructor's consent.

345—Pipeline Engineering (3). Theoretical and practical aspects of pipeline engineering including pipeline transport

Civil Engineering

of natural gas and various solids such as coal, sand and solid wastes. Prerequisites: 251 and Mechanical and 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 adviser, 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 and strains. Prerequisite: Engineering 195.

353—Experimental Stress Analysis (3) (same as Mechanical and Aerospace Engineering 353). Photo elastic, electric strain gage, brittle lacquer methods of experimental stress analysis for static loads. Strain gage work includes strain rosettes. Prerequisite: Engineering 195.

355—Soil Mechanics (3). Detailed study of physical and mechanical properties of soil governing its behavior as an engineering material. Prerequisite: Engineering 195.

363—Urban Development and Planning (3). Introduction to planning processes; procedures and forces that shape urbanization. Prerequisite: senior standing.

365—Engineering Administration (3). Cash flow analysis, financial analysis, managerial accounting and cost control, budgeting, organizational structure and behavior. Prerequisite: junior standing and Mathematics 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—Construction Planning and Scheduling (3). Planning and scheduling of construction operations by the critical path method. Network diagramming, scheduling computations and time-cost trade-offs. Manpower and equipment leveling. Computer and noncomputer techniques. Prerequisite: senior standing.

369—Construction Methods and Equipment (3). Selection and use of construction equipment, planning construction operations, equipment economics and operations analyses. Prerequisite: junior standing and Mathematics 60 or 80, or instructor's consent.

372—Foundation Engineering (3). Design of basic foundation structures: shallow foundations, retaining walls, deep foundations. Prerequisite: 355.

373—Optimization of Civil Engineering Systems (3). Automated design techniques such as linear, non-linear and dynamic programming; gradient and random searching. Civil engineering applications emphasized throughout. Prerequisite: senior standing.

374—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.

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.

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. Prerequisite: 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. Prerequisite: 210 or 212 concurrently.

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.

392—Water and Wastewater Treatment Processes (3). Planning, layout and design of municipal and industrial water and wastewater treatment systems. Prerequisite: 391.

393—Sanitary 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 wastewater treatment to pollution from persistent chemicals and to specific control parameters. Prerequisite: senior standing or instructor's consent.

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.

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.

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 solid and fluid mechanics investigated. Prerequisites: 251, Mathematics 304 and 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 shapes. 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. Prerequisite: 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. Prerequisite: 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.

424—Design of Special Structures Systems (3). Reviews current trends in design of structural systems and components. Critical evaluation of recent code modifications. Application to design of light gauge metal structures, lateral bracing systems, curved beams and panel systems. Prerequisite: 324 or 326.

430—Reinforced Concrete Theory and Design (3). Advanced design of reinforced concrete structures; review of standard codes and specifications and their influence. Prerequisite: 375 or equivalent.

441—Advanced Hydraulic Engineering (3). Rapidly varied flow and design of transition structures. Hydraulic design of spillways, reservoirs and related structures. Prerequisite: 340.

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.

450—Construction Engineering (3). Selection and layout of construction plant. Design and construction of formwork, falsework, cofferdams, conveyors and other temporary structures used by contractors. Prerequisite: 369 or equivalent.

451—Construction Productivity (3). Work improvement techniques in the construction industry reviewed and applied to local construction site. Construction safety influenced by supervisors and managers studied in detail. Declining productivity in the construction industry evaluated and solutions considered. Prerequisite: 367.

452—Construction Project Management (3). Cost analysis, estimating techniques. Time, cost and quality control of construction projects. Recording/analyzing construction effort. Applications of crew balance, process charts, time-lapse motion pictures, operations research and preplanning techniques to construction operations. Construction safety.

453—Construction Administration (3). Organization, management, engineering, business and legal problems in the construction industry. Purchasing, bonding, insurance, financing, labor relations and contract administration. Prerequisite: 367 or concurrently.

457—Land Use Planning (3). Case study of site planning using systems analysis; feasibility for development or redevelopment; restraints imposed by political, social and economic conditions on land use activity as related to urban and regional relationships. Prerequisite: 363.

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. Prerequisite: 251 or equivalent.

465—Wind Engineering (3).
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. Ductility. Bond and anchorage. Prerequisite: 222.
486—Finite Element Methods (3) (same as Mechanical and Aerospace Engineering 486).
490—Research (cr. arr.). Independent investigation in the field of civil engineering to be presented in the form of a thesis.
491—Unit Process Laboratory (3). Studies chemical and physical relationships as applied to unit processes of water and wastewater. Prerequisites: 393 and 394.
492—Physiochemical Treatment Processes (3). Fundamental principles, analysis and modeling of physical and chemical processes for water and wastewater treatment. Prerequisite: 391.
493—Biochemical Treatment Processes (3). Biochemical principles, kinetic models and energy considerations in the design of biological wastewater treatment processes. Prerequisite: 391.
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: 391
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. Prerequisite: 391 or instructor's consent.

Classical Studies

College of Arts and Science
420 General Classroom Building (314)882-0679

FACULTY

Charles Saylor, chairman, professor, PhD, University of California
Barbara P. Wallach, director of graduate studies, associate professor, PhD, University of Illinois
Eugene N. Lane, professor, PhD, Yale University
Theodore A. Tarkow, professor, PhD, University of Michigan
John C. Thibault, professor, PhD, University of Illinois
Victor A. Estevez, associate professor, PhD, University of Wisconsin
David Schenker, assistant professor, PhD, University of California

DEGREES: MA in classical languages

INTERDISCIPLINARY AREA PROGRAM: PhD in classics and classical archaeology

The Department of Classical Studies offers graduate work leading to the master of arts degree in classical languages in Greek or in Latin. With the Department of Art History and Archaeology the department offers the doctor of philosophy degree in classics and classical archaeology. The MA in classical languages normally is taken by students who intend to pursue the PhD degree.

Graduate programs in classical studies are designed to prepare students for professional careers as teachers and scholars of classical literature and ancient civilization. In addition to acquiring expertise in the traditional classical disciplines, students are encouraged to acquire some familiarity 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, their facilities are available to graduate students from Missouri. It is often feasible to study in Athens or Rome after completing the work for 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 language and literature, as well as in the various ancillary fields. This collection is supplemented by the department's Walter Miller Collection. 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 are a bachelor of arts degree from an accredited college or university, a reading knowledge of Greek or Latin, and a 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 15 hours in Greek, Latin, classics and related fields must be at the 400 level, and at least six hours should be in courses in other departments. At least 18 hours must be in Latin and classics, Greek and classics or Latin, Greek and classics. A student may minor in a related field or may spread related work over several areas. A minor shall consist of no less than 10 and no more than 12 hours. Classical Studies 409 is required of all students in their first year of graduate study.

While there is no foreign language requirement for the MA degree, students are strongly advised to pass a reading comprehension examination in one foreign language during their first year of graduate work.

During the first month of graduate study the student and adviser should plan a reading list, consisting of original and translated works that pertain to the student's major interests. An examination on the reading list is part of the final examination for the degree.

An hour-long final oral examination is given by a faculty board. If a thesis has been submitted, this examination will include defense of the thesis and general questions within fields related to the thesis. The examination cannot be administered during the summer session.

COURSES

CLASSICAL CIVILIZATION

201—Topics in Classical Studies (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: sophomore standing and 60 or Art History and Archaeology 10 or History 102.
224—Roman Classics in Translation (3). Reading in translation and critical study of the most important literary works of the ancient Roman world. Prerequisite: sophomore standing and 60 or Art History and Archaeology 10 or History 102.
225—Greek Classics in Translation (3). Reading in translation and critical study of the most important literary works of the ancient Greek world. Prerequisites: sophomore standing and 60 or Art History and Archaeology 10 or History 102.
226—Greek Drama (3). Reading and interpretation of Greek tragedies and comedies in translation. Prerequisites: sophomore standing and 60 or Art History and Archaeology 10 or History 102.
227—Advanced Mythology (3). Interpretation of selected classical myths and their influences on later literature and art. Prerequisites: sophomore standing and 60 or Art History and Archaeology 10 or History 102.
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: sophomore standing and 60 or Art History and Archaeology 10 or History 102.
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. Prerequisites: 60 or equivalent and sophomore standing.
260—Greek and Roman Religion (3). Survey of religious development among the Greeks and Romans. Prerequisites: sophomore standing and 60 or Art History and Archaeology 10 or History 102.
301—Topics in Classical Studies (cr. arr.). Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing and 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: junior standing.

CLASSICS

201—Topics (cr. arr.). 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). Integrated exploration of classical civilization. May repeat to six hours maximum. Prerequisite: limited to honors undergraduates, 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.
323—Greek and Roman Numismatics I (3) (same as Art History and Archaeology 323).
324—Greek and Roman Numismatics II (3) (same as Art History and Archaeology 324).
330—Introduction to Text Criticism and Paleography (3). Latin and Greek textual criticism and paleography, using manuscript facsimiles at the University's library. Prerequisite: two years of classical languages or equivalent.
350—Special Readings (1-3). Readings in authors and texts not covered in other courses. Prerequisite: classics/classical civilization, departmental consent; two years of classical Greek or equivalent; two years of Classical Latin or equivalent required.
380—Advanced Study in the Teaching of the Classics (3). Prerequisite: 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.
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.
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 theses or dissertations.

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 three hours of 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 of credit. Prerequisite: graduate standing.

209—Intensive Greek Reading (2).
210—Intermediate Readings (3). Selected advanced readings in prose and poetry. Introduction to Homer. Prerequisite: 3 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 of Classical Greek or equivalent.
305—Greek Comedy (3). Selected plays of Aristophanes and Menander, with special attention to cultural contexts. Prerequisite: two years of Classical Greek or equivalent.
306—Greek Lyric Poetry (3). Selected readings from lyric poets, with attention to verse, forms and dialects. Prerequisite: two years of Classical Greek or equivalent.
307—Greek Oratory (3). Selections from Greek orators, with emphasis on Lysias and Demosthenes. Prerequisite: two years of Classical Greek or equivalent.
308—Greek Philosophers (3). Emphasis on readings and analyses of selected texts of major Greek philosophers. Prerequisite: two years of Classical Greek or equivalent.
310—Greek Historians (3). Reading and analyzing selected texts of major Greek historians. Prerequisite: two years of Classical Greek or equivalent.
315—Homer (3). Reading, discussion and literary analysis of Iliad and Odyssey. Prerequisite: two years of 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: 3.
350—Special Readings (1-3). Readings in authors and texts not covered in other courses. Prerequisites: departmental consent, two years of 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 of Classical Greek or equivalent.
425—Seminar in Greek Drama (3). May be repeated to a maximum of six hours.
440—Seminar in Greek Lyric Poetry (cr. arr.).
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 midfifth-century B.C. 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 three hours of credit. Prerequisite: graduate standing.
207—Continuation of 201. Readings in Latin prose. Prerequisite: graduate standing.
209—Intensive Latin Reading (2).
210—Latin Poetry (3). Readings in selections from the Latin poets. Prerequisite: 3 or equivalent.
303—Latin Stylistics (1-3). Study and writing of connected prose compositions.
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 of 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 of 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 of Classical Latin or equivalent.
325—Latin Epigraphy (3). Introduction to the study of Latin inscriptions and their contributions to ancient culture. Prerequisite: 3.
335—Neronian Literature (3-6). Critical readings in and integrated analysis of culture of the age of Nero. Prerequisite: two years of 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 of Classical Latin or equivalent.
350—Special Readings (1-3). Readings in authors and texts not covered in other courses. Prerequisites: departmental consent, two years of 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 of Classical Latin or equivalent.
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 (cr. arr.).
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).

Classics and Classical Archaeology

College of Arts and Science
420 General Classroom Building (314)882-0679

FACULTY

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Victor A. Estevez, associate professor, PhD, University of Wisconsin
David Schenker, assistant professor, PhD, University of California

DEGREE: PhD in classics and classical archaeology

The minimum requirements for acceptance for advisement in the PhD program include an bachelor of arts degree from an accredited college or university, a reading knowledge of Greek or Latin and sufficient reading knowledge of German or French (or, in justifiable instances, Italian).

The minimum course of study for the degree is 36 to 42 hours in classical studies at the 300 and 400 levels; at least eight hours of dissertation credit not included in formal course work; and a passing grade of A or B in at least 24 hours of graduate-level courses outside the major department (at least 15 must be in one department, field, area or program).

The precise details of the student's program are determined by the student and adviser. Courses in classical archaeology must be taken at some time during the student's program.

Though some command of German, French or Italian is necessary from the outset, students are required to have demonstrated proficiency in one of the languages by the time they register for their second year of graduate study and in the second language by the time they register for their third year. By the beginning of the second year, the student should ask the adviser to recommend a doctoral program committee of five people to administer the two-part departmental qualifying examination. The written examination consists of translations of passages from Greek and Latin literature, based on a reading list composed by the student and adviser. The oral examination covers the major authors and works of the classical periods of Greek and Latin literature.

After satisfactory residency, language and course requirements, the student must pass the comprehensive examination consisting of five examinations in the following fields
- Greek literature
- special author (Greek)
- Latin literature
- special author (Latin)
- minor field

A special topic may be substituted for one of the special authors.

The student then should complete a dissertation, secure approval of it and pass a final oral examination on the dissertation and related subjects.

Communication

College of Arts and Science
115 Switzler Hall (314)882-4431

FACULTY

James W. Gibson, chairman, professor, PhD, The Ohio State University
Michael Porter, director of graduate studies, associate professor, PhD, University of Iowa
Mary-Jeanette Smythe, associate professor, PhD, Florida State University
G. Joseph Wolfe, associate professor, PhD, University of Iowa
Pamela J. Benoit, associate professor, PhD, Wayne State University
David Barker, assistant professor, PhD, University of Texas
William L. Benoit, assistant professor, PhD, Wayne State University
Michael W. Kramer, assistant professor, PhD, University of Texas

DEGREES: MA and PhD in communication, with a concentration in radio-television or speech communication

The area of speech communication takes a theoretical, critical, and experimental approach to the study of communication. The area of radio-television takes a historical, critical and theoretical approach to the study of radio and television in our society.

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, 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, theory, history, criticism, and critical studies.

A speech communication laboratory and radio-television studios serve as facilities for research and practice.

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
- 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 non-thesis 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 9 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 only three 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 who 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 60 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:
- 42 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)
- Research Practicum (1-6 hours)

A student may satisfy the foreign language-related field requirement for the PhD in communication as follows:
- complete with grades of B or better, at the post-master's level, two blocks of course work of nine semester hours each (in courses at the 200 level and above) that are taken outside of 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 12-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 6 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 towards 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). Principles, practices of audio production in varied program formats. Prerequisites: 105 and instructor's consent.

207—Introduction to Corporate and Instructional Television (3). Professional video communication in non-broadcast settings; management, programming, production, evaluation and delivery/marketing. Prerequisite: sophomore standing.

210—Introduction to Radio, TV Writing (3). Styles and functions of various script formats for radio and television productions. Prerequisite: 105 or instructor's consent.

270—Culture and Communication (3) (same as Anthropology 270).

272—Argument and Advocacy (3). Critical analysis and production of argument, emphasizing evidence, reasoning and refutation. Prerequisite: 75.

273—Communication in Campaigns (3). Study of role and impact of communication in political campaigns; historical and contemporary study of influence by communication; case studies and practicum.

275—Business and Professional Speech 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. Prerequisite: 75 or instructor's consent.

280—Internship (1-3). Directed professional experience within and outside the University in communication-related fields or organizations. Prerequisites: junior standing, instructor's consent and 2.5 GPA. S/U graded only.

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 (cr. arr.). 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 and instructor's consent.

305—Television Studio Production (3). Operation of television studio production equipment; processes and procedures of producing and directing. Prerequisites: 105, junior standing and instructor's consent.

307—Broadcast Regulation and Responsibility (3). Federal, state regulations affecting programming, operating policies of American broadcast stations; administrative authority of the 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. (Will count as partial fulfillment of the requirement in humanistic studies.) Prerequisites: junior standing and instructor's consent.

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.

315—Language and Discourse (3). Analysis of the rules of social interaction and the functions of language in discourse. Prerequisites: junior standing and departmental consent.

325—Television Field Production (3). Theory and practice of TV field production, including preproduction, production with portable equipment, and electronic editing. Prerequisites: junior standing, 305 and instructor's consent.

335—Television Technology (3). Introduction to television hardware systems, including reproduction and recording systems, emphasis on proficient operation of and understanding of common causes of problems within those systems. Prerequisite: 305 or 325 or instructor's 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.

350—Directed Reading (1-3). Independent reading, reports. Prerequisites: junior standing or instructor's consent.

357—Issues in Broadcast Management (3) (same as Journalism 357). Broadcast administration, sales, programming, network relationships, community involvement, labor, FCC procedures, cable TV and new technologies. Prerequisite: instructor's consent.

374—Theory and Research in Persuasion (3). Studies the persuasive process, attitude formation, modification. Prerequisites: 276 and departmental consent.

376—Communication in Organizations (3). Theories of

communication systems and processes in organizational structures; study of communication behavior in formal and informal organizational settings. Prerequisites: 171 or departmental consent.

377—Senior Performance Seminar (1). Participation in group and individual performance activities, with demonstrated mastery of public communication skills. Required for all speech communication majors. Prerequisite: senior standing.

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: 305 and instructor's consent.

400—Problems (cr. arr.). Individual study not leading to thesis or dissertation. Prerequisite: instructor's consent.

401—Topics (cr. arr.). 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 in Communication (3). Quantitative methods of communication research. Prerequisites: 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). Use, design, production, evaluation, technical aspects and management of educational television. Prerequisite: instructor's consent.

408—Seminar in Radio-TV (1-6). Directed research in radio and television. Prerequisites: 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 that 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).

441—Introduction to Graduate Studies in Communication (3). Introduction to research traditions and current methodologies within the field of communication, orientation to the literature of the field and styles of scholarly writing.

450—Research (cr. arr.). 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 speech. Prerequisite: instructor's consent. May be repeated.

483—Seminar in Rhetorical Theory (3). Directed research on selected topics in American rhetoric and public address. Prerequisite: instructor's consent.

485—Rhetorical Criticism (3). Principles, practice of rhetorical theory from 16th century to present. Prerequisites: 381 or instructor's consent.

486—Seminar in Theories of Rhetoric and Criticism (1-6). Directed research on selected topics in rhetorical theory and criticism. Prerequisite: instructor's consent.

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 (cr. arr.). Research leading to thesis or dissertation. Prerequisite instructor's consent.

Communicative Disorders

School of Health Related Professions
125 Parker Hall (314)882-3873

FACULTY

James D. Amerman, chairman, professor, PhD, University of Illinois

Martha M. Parnell, associate professor, PhD, University of Missouri-Columbia

J. Brad Allard, assistant professor, PhD, University of Missouri-Columbia

Ronald B. Gillam, assistant professor, PhD, Indiana University

Linda S. Day, clinic director, MA, University of Missouri-Columbia

Shirley S. Patterson, clinical instructor, MA, University of Missouri-Columbia

Eva Trumbower, clinical instructor, MS, Central Missouri State University

DEGREE: MHS in communicative disorders, with an emphasis area in speech-language pathology

COOPERATIVE DEGREE: PhD in cooperation with the communication department, with an emphasis area in speech pathology-audiology

The communicative disorders program offers graduate work leading to the degrees of master of health science and doctor of philosophy. The PhD is currently offered through the communications department. The graduate program permits specialization for professional, academic and clinical training at the master's level and provides for advanced study and research at the doctoral level, leading to careers in college teaching and research or to careers in the direction of service, training or research programs.

In formulating individual student programs that best fulfill academic and clinical training requirements, the program utilizes many clinical and scientific resources and cooperative facilities on and off campus. Included in the list of cooperative facilities are the MU Health Sciences Center, Rusk Rehabilitation Center, Veteran's Administration Hospital, Audrain County Medical Center, Columbia Public Schools and local and regional preschools. Additionally, the program operates the speech and hearing clinic at MU, a complete diagnostic and treatment center that serves communicatively handicapped individuals from the campus and community. The program also maintains its own laboratory with sophisticated equipment used for the objective clinical evaluation of communicative disorders and research in the areas of normal and abnormal speech, language and hearing.

The faculty and students at all levels of instruction in the program enjoy the advantage of a large, multipurpose university offering an excellent academic environment for the study of speech-language pathology and audiology. Among these are excellent library and computer facilities and a comprehensive medical school facility.

The program maintains close affiliation with the American Speech- Language-Hearing Association, with its master's degree in speech-language pathology enjoying continuous accreditation since 1965. In addition, the program sponsors an active local chapter of the National Student Speech- Language-Hearing Association.

MASTER'S DEGREE: A selection committee determines acceptance for advisement in the program. The applicant must submit official undergraduate transcripts, GRE general test scores (quantitative and verbal scores must total at least 900), a letter of intent, three letters of recommendation and meet the minimum 3.0 GPA (A=4.0) for the last 60 hours of undergraduate work and for all graduate work completed. The candidate currently pursuing an undergraduate major in speech-language pathology must provide one letter of recommendation from a certified clinical supervisor associated with the bachelor's program. Personal interviews will be scheduled if suitable arrangements can be made between the selection committee and candidate.

Students admitted to the master of health science program must complete, at MU or elsewhere, the requirements for an undergraduate major in speech-language pathology. In addition, master's degree candidates are required to complete a minimum of 36 semester hours in graduate-level courses with a B or higher. No fewer than 24 hours must be earned in 400-level graduate courses offered by the communicative disorders program. A maximum of six hours in clinical practicum courses will be allowed as part of the final 36-hour requirement.

Students must satisfactorily pass a written comprehensive examination during the final semester of course work toward the master's degree. Students may take the American Speech-Language-Hearing Association national certification examination to satisfy this requirement.

Individual programs in the major specialization area (speech-language pathology) are determined in consultation with a graduate adviser. Student programs are monitored carefully so that program requirements and the requirements for the Certificate of Clinical Competence in Speech-Language Pathology issued by the American Speech-Language-Hearing Association are satisfied.

DOCTORAL DEGREE: ***For more specific information concerning the doctoral program, write Dr. James D. Amerman, Program Director, Communicative Disorders, 317 Lewis Hall, Columbia, Mo. 65211.***

COURSES

301—Topics in Communicative Disorders (cr. arr.). 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.

321—Speech, Language and Hearing Services in the Schools (1) (same as Linguistics 212). An introduction to principles and practices of delivery of speech-language-hearing services to communicatively handicapped children in school settings. Prerequisite: 220 or instructor's consent.

322—Alternative/Augmentative Communication (2). A survey of non-speech communication modes for handicapped individuals, communicative evaluation, selection of non-speech systems and intervention strategies to establish and maintain functional communication. Prerequisite: 120.

325—Clinical Practice in Speech Pathology (2-3). Application in clinical practice of diagnostic and remedial techniques for speech, language disorders. May be repeated for credit. Prerequisites: 202 and 220.

330—Introduction to Audiology (3). Hearing sciences, evaluation, conservation and aural rehabilitation.

334—Auditory Rehabilitation (3). Speech-reading, principles and techniques of auditory training for acoustically handicapped children and adults. Prerequisite: 330.

350—Directed Reading (1-3). Independent reading; reports. Prerequisite: instructor's consent.

400—Problems in Communicative Disorders (cr. arr.). Individual study not leading to thesis or dissertation. Prerequisite: instructor's consent.

401—Topics in Communicative Disorders (cr. arr.). Study of selected topics in Speech Pathology/Audiology. Topic and credit may vary from semester to semester. Prerequisite: instructor's consent, instructor's and departmental consent for repetition.

402—Developmental Language Disorders (3). Nature, etiology, assessment and management of childhood language disorders. Prerequisite: 202 or instructor's consent.

403—Acquired Language Disorders (3). Emphasis on nature, etiology, assessment and management of acquired aphasia. Prerequisite: 402 or equivalent or instructor's consent.

410—Acoustic Phonetics (3) (same as Linguistics 410). Research methodologies in analysis of acoustic features underlying speech, language processes and perceptual correlates. Prerequisite: 210 or equivalent.

411—Physiological Phonetics (3) (same as Linguistics 411). Research methodologies in analysis of physiological features underlying speech, language processes, theories of encoding and decoding, control mechanisms. Prerequisite: 210 or equivalent.

412—Laboratory Instrumentation in Communication Disorders (3). Theory, research and practice in use of instruments for evaluation of normal/abnormal voice, articulation. Prerequisites: 210, 410 or 411 or instructor's consent.

420—Motor Speech Disorders (3). Description, etiology, diagnosis and remediation of speech and language problems resulting from neurological or myogenic impairments. Prerequisites: 210, 220, 221 or equivalent or instructor's consent.

421—Fluency Disorders (3). Identification and remediation of fluency disorders in children and adults. Prerequisites: 210, 220, 221 or equivalent or instructor's consent.

422—Voice and Cleft Palate (3). Communication disorders associated with vocal pathologies and craniofacial anomalies. Prerequisites: 210, 220, 221 or equivalent 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—Diagnostics in Speech-Language Pathology (3). General principles of diagnosis; specific diagnostic tests and procedures for various speech and language disorders. Prerequisite: instructor's consent.

435—Clinical Practice in Audiology (1-3). Supervised practicum with diagnostic and rehabilitation programs. May be repeated for credit. Prerequisite: 330.

450—Research in Communicative Disorders (cr. arr.). 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 six 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 six credits. Prerequisite: instructor's consent.

490—Research in Communicative Disorders (cr. arr.). Research leading to thesis or dissertation. Prerequisite: instructor's consent.

Community Development

College of Agriculture, Food and Natural Resources
723 Clark Hall (314)882-8393

FACULTY

William E. Robertson, chairman, professor, PhD, Wisconsin University

James B. Cook, director of graduate studies, assistant professor, PhD, Walden University

Alvin S. Lackey, professor, PhD, Cornell University

Lee J. Cary, professor emeritus, PhD, University of Syracuse

Bryan Phifer, professor emeritus, PhD, University of Chicago

Hugh Denney, professor emeritus, MA, University of Missouri-Columbia

John A. Croll, associate professor, MS, University of Missouri-Columbia

Boyd Faulkner, associate professor emeritus, MS, University of Nebraska

E. Frederick List, associate professor emeritus, MA, EdD, Washington University-St. Louis

Donald W. Littrell, associate professor, MS, University of Missouri-Columbia

George F. Nickolaus, associate professor, University of Missouri-Columbia

Jack D. Timmons, associate professor, PhD, University of Nebraska

Jerry L. Wade, associate professor, PhD, University of Missouri-Columbia

Raymond Lenzi, assistant professor, PhD, Southern Illinois University-Carbondale

DEGREE: MS in community development

THE MASTER OF SCIENCE in community development is one of only a few such programs offered in the United States. Specific courses and field experience help prepare students for professional practice with urban careers, rural and regional positions and international work. Within the elective component of the master's program, students may take an area of specialization in planning, public administration, gerontology, youth work, urban affairs, international development or research and evaluation.

An applicant with an overall undergraduate GPA of 3.0 (A=4.0) in the last 60 hours of the undergraduate program of study may be accepted for advisement in the program. Students accepted in the program must pass a qualifying examination at the end of their first semester to be admitted to candidacy for the master of science degree.

A total of 39 credit hours is required for a master of science in community development. The core curriculum consist of 27 credit hours in the Department of Community Development, including six hours of field experience. The remaining 12 hours consist of elective courses selected by the student and adviser. Electives may be selected from non-core courses in the Department of Community Development and appropriate courses offered by other departments. At the student's option, the elective courses may be concentrated in a single field of study to constitute an area of specialization.

The department also offers an 18-hour diploma program.

The department is responsible for in-service training and supports the community development field staff employed by the University of Missouri System's Extension Division. In addition to other academic responsibilities, members of the faculty hold extension appointments. Through extension activities, the faculty and students maintain contact and involvement with communities in Missouri and with the practice of community development.

COURSES

300—Community Development Perspectives (3). Historical, philosophical perspectives of community development form the base for this course. Examines concepts, values, principles of community development as an introduction to community development theory, practice.

301—Topics in Community Development (1-3). Organized study of selected topics in community development. Particular topic and earnable credit may vary from semester to semester. Prerequisite: instructor's consent.

310—Community Development Theory (3). Relevant social systems theory reviewed as it applies to conscious, deliberate efforts to affect community, social, economic, political development. Relation of theory to action and specific methods considered in the context of professional practice.

315—Strategies for International Community Development (3). Acquaints students with past and present international development efforts and to the basic principles and practices of community and rural development. Students spend one week in field living with host families and studying a rural community.

320—Group and Interpersonal Competence (3). Opportunity for observation and extensive participation in group process emphasis on interpersonal competence; use of group techniques in community development work. Selected readings in social psychology related to aspects of group principles and practices. S/U graded only.

330—Professional Practice of Community Development (3). Introduces professional practice methods through selection of field methods appropriate to specific situations and consistent with community development theory.

350—Special Readings Community Development (3). Extensive reading in selected area or intensive reading in special field.

360—Principles and Practices of Planning (3). Defines and examines planning process. Consideration given to scope and purpose, governmental framework, concepts of form and structure, research methods, development of alternatives and implementation.

362—The Implementation of the Local Planning Process (3). Implementation of planning process analyzed within context of contemporary scene in the United States. Consideration given to advantages and limitations of various devices and to emergence of new approaches to planning implementation.

364—Area and Regional Planning (3). Concepts, techniques, procedures of community, regional planning. Methods of collection, analysis, integration of pertinent economic, social, political, physical data. Estimation of future needs; allocation of space for planning future growth; development of areas.

370—Seminar in International Development (3). Interdisciplinary seminar on international development. Devel-

opment theories and problems including social, political and administrative aspects explored; sectoral areas such as population, rural development, education and health analyzed. Roles of various development agencies discussed.

372—Community Development in Lesser Developed Countries (3). Traces history and definitions of community development in Third World context. Analyzes economic/social/political/administrative implications of community development. Investigates organization/implementation/results of programs; particular attention given to case studies.

382—Principles and Practices of Fund Raising (3). This course is designed to provide students with a basic understanding of fund raising and the program evaluation associated with it. Students will be given an opportunity to examine some non-profit organizations, assess those programs and develop a fund-raising campaign.

384—Elderly Consumer-Participants in Human Service Delivery (3). Elderly as consumers of services/participants in-service delivery systems services offered, special participation problems, social dynamics of service delivery systems and intervention points, community strategies to effect and improve service delivery.

400—Problems Community Development (3). Intensive study of an area of community development related to student's special interest.

410—Community Development Process (3). Definition and analysis of CD process and its application in traditional and transitional organizations. Attention given to interrelated social, economic, political, institutional and culture factors pertaining to establishment and operation of the process.

417—Government Social Policy and Institutional Resources (3). Examines historical and contemporary developments of U.S. social policies and institutional arrangements implementing them. Analyzes current social policy issues and forces affecting their resolution.

420—Field Experience Community Development (3-12). Field practice in selected community setting under faculty or other competent supervision.

425—Community Development Research Methods and Techniques (3). Introduction to social science research methods and techniques, with consideration given to a variety of research approaches and techniques. Particular application of these approaches to community development research and evaluation is stressed.

430—Community Development Seminar (3). Integration of theoretical knowledge and current practice problems in community development. Students and faculty decide issues and topics to be the focus.

440—Specialized Topics in Community Development (1-3). Specialized topics of developments in related fields of special pertinence to community development.

450—Research Community Development (1-6). Student expected to demonstrate graduate ability in designing and carrying out a research project not leading to thesis or to produce non-research product (creative endeavor) that demonstrates mastery of subject matter.

490—Thesis Research (1-6). Student demonstrates theoretical knowledge and skills in research leading to thesis.

Computer Science

College of Arts and Science
304 Mathematical Sciences Building
(314)882-3842

FACULTY

Paul K. Blackwell, chairman, professor, PhD, Syracuse University

Gordon K. Springer, director of graduate studies, associate professor, PhD, Pennsylvania State University

Otho R. Plummer, director of campus computing, professor, PhD, University of Texas-Austin

Donald R. Shurtleff, professor, PhD, Worcester Polytechnic

Frederick N. Springsteel, associate professor, PhD, University of Washington

Thomas W. Benet, assistant professor, PhD, University of Maryland, College Park

Gordon E. Franck, assistant professor, PhD, University of California-Irvine

Youran Lan, assistant professor, PhD, Michigan State University

Alexander Meduna, visiting assistant professor, PhD, University of Brno-Czechoslovakia

Youssef G. Saab, assistant professor, PhD, University of Illinois-Urbana

DEGREE: MS in computer science

The master's degree program in computer science prepares graduates for further study at the doctoral level or for careers as computer professionals. Faculty research interests include parallel and distributed computer systems, natural language processing, concrete computational complexity, design of parallel algorithms, data base theory, entity-relationship analysis, artificial intelligence, computer networks and graphics.

The academic computing facilities available to computer science students provide varying degrees of access to mainframes, minicomputers, workstations and microcomputers. The campus mainframe, an IBM 3090/170J, providing both interactive and batch computing access, is heavily used in any courses at all levels. The Computer Science Department maintains and operates the Computer Science Laboratory (CSLab) that is equipped with two DEC MicroVax II minicomputers, two DEC VaxStation II workstations, nine HP/Apollo high-resolution graphics workstations, two Texas Instrument Explorer (A.I.) workstations, a Sun workstation and other equipment. All of the machines in the CSLab are interconnected via an extensive network consisting of an Ether-net Lan, HP/Apollo Domain Token Ring Lan, a hardware gateway to the University's IBM SNA network and a connection to the MU campus' IBM Token Ring backbone network. These connections also provide access to various national and international computer networks such as Bitnet, Midnet, NSFnet and the Internet. All of these facilities provide a wealth of opportunity for students to study and use current, state-of-the-art computing resources.

The Mathematical Sciences Library, which contains about 30,000 volumes and receives about 425 scholarly journals also is in the Mathematical Sciences Building.

MASTER'S DEGREE: To be accepted for advisement, an applicant must have:

- proficiency in Pascal and one other programming language
- proficiency in fundamental data structures and algorithms equivalent to CS203
- knowledge of internal representations, assembly language and computer organization equivalent to CS210
- three semesters of calculus, a mathematics course beyond calculus and a course in discrete mathematics
- a GPA of 3.0 (A=4.0) for the last half of the undergraduate course of study
- acceptable scores on the GRE general test (The advanced test in computer science is not required.)

Requirements for the MS degree include a GPA of 3.0 on 30 hours of credit, including 24 hours of course work covering both practical and theoretical aspects of computing and six hours of thesis research carried out under the supervision of a faculty adviser.

COURSES

201—Topics (cr.arr.). Topic and credit may vary from semester to semester. May be repeated upon consent of department. Prerequisite: departmental consent.

202—Programming as a Research Tool (3). Emphasis on the use of the Statistical Analysis System (SAS) for analysis of variance, as a data base language. Includes SASGRAPH, introduction to CMS and XEDIT, word processing in the IBM PC and Macintosh environments. This course is coordinated with Statistics 395 but concurrent enrollment is not required. Prerequisite: Statistics 207 or equivalent.

203—Computer Science II (3). A study of fundamental techniques and algorithms for representing and manipulating data structures using the Pascal language. Topics include recursion, linked lists, stacks, queues, trees and efficient methods of sorting and searching. Prerequisite: 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.

208—Files, JCL and Utilities (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. Prerequisite: 203.

210—Introduction to System Concepts (3). Introduces fundamental concepts of computer systems including: data representation, computer arithmetic, Boolean algebra, SSI logic components, SSI logic design, register-transfer and micro-operations, computer organization, assemblers and the assembly process, introduction to IBM 370 assembler language. Prerequisite: 203.

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: 203.

212—Assembly Language Program (3). Introduction to programming in IBM 370 assembly language. Includes the use of macros, conditional assembly and advanced techniques. Prerequisite: 210.

215—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. Prerequisite: 203.

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. Available on S/U basis only. Prerequisite: departmental consent.

300—Problems (cr. arr.).

301—Topics (cr.arr.). Topic and credit may vary from semester to semester. May be repeated upon consent of department. Prerequisite: departmental consent.

304—Computer Science Laboratory (1-3). Introduction to the use of the hardware and software in the Computer Science Laboratory. Prerequisite: departmental consent.

310—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: 203 and Mathematics 175.

315—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: 215.

320—Data Structures and Algorithms (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 also are studied. Prerequisite: 208 and Mathematics 226.

321—Expert Systems (3). Introduction to expert system shells, designed for graduate students from any department. Students create prototype expert systems under close supervision of faculty experts. Prerequisite departmental consent.

323—Numerical Analysis (3) (same as Mathematics 323).

324—Numerical Linear Algebra (3) (same as Mathematics 324).

325—Artificial Intelligence I (3). Concepts and theories of intelligent systems. Introduction to programming in LISP and Prolog. Applications to game playing, theorem proving, natural language understanding and expert system. Prerequisites: 203 and junior standing.

330—Digital Logic and Computer Design (3). Presents the basic tools, methods and procedures to design combinational and sequential digital circuits and systems at the SSI, MSI and LSI levels. Accumulator and register type ALU's, wired and microprogrammed control units, and a character I/O interface are designed. Prerequisite: 210.

337—Applied Modern Algebra (3) (same as Mathematics 337).

341—Theory of Automata I (3) (same as Electrical and Computer Engineering 341). 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. Prerequisites: 210 and Mathematics 226.

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. Prerequisites: 210 and Mathematics 226.

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: 203.

350—Special Readings (1-3).

351—Systems Programming (3). Analysis and design of multiprogramming and multiprocessing systems, with a close examination of loaders, dynamic programming structures, and IBM's VM and MVS operating systems. Prerequisites: 208 and 212.

352—Operating Systems I (3). The hardware, firmware and software organization of computer systems; basic operating systems concept, concurrent processes, CPU and disk scheduling, memory management, deadlocks, systems evaluation and simulation, and performance measurement. Prerequisites: 210 and Mathematics 226.

353—UNIX Operating System with C (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: 203.

365—Data Base Management Systems I (3). Fundamental concepts of current data base 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: 215.

370—Software Development Methodology (3). Overview of software life cycle processes. Practical and theoretical topics, including systems analysis and requirement specification, software design, implementation, testing and maintenance. Prerequisite: 215 or departmental consent.

380—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. Prerequisites: 210 and Mathematics 226.

400—Problems (1-3).

401—Topics (cr. arr.). Topic and credit may vary from semester to semester. May be repeated upon consent of department. Prerequisite: departmental consent.

410—Computer Graphics II (3). Further study of computer graphics, including both 2-D and 3-D graphics, surface modeling, transformations, shading, standard graphics software (CORE, GKS and PHIGS) and interfaces (MOTIF). Selected current topics in graphics such as animation, CAD and visual realism also will be discussed. Prerequisite: 310.

420—Algorithm Design and Analysis (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: 320.

425—Artificial Intelligence II (3). Further discussion of theories and techniques of artificial intelligence. Advanced programming in LIPS and PROLOG and introduction to the use of A.I. workstations. Prerequisite: 325.

430—Computer Architecture and Organization (3). Architecture and organization of advanced computer systems, including vector, pipeline, and array processors; multiprocessor and multicomputer systems; RISC and data flow computers; case studies of typical systems; and discussion of parallel algorithm design. Prerequisite: 330.

441—Theory of Automata II (3) (same as Electrical and Computer Engineering 441). 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.

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. Prerequisites: 212 and 343.

450—Research (cr. arr.). Research and investigation of a topic, not leading to a thesis. Prerequisite: departmental consent.

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. Prerequisite: 352.

465—Data Base Management Systems II (3). Further principles of data base systems design, organization, and implementation. Extended entity-relationship, relational, hierarchical and network models; storage organizations and methods; data definition and manipulation; alternative design methodologies; issues involving modern multiuse systems. Prerequisite: 365.

470—Software Development Methodology II (3). Further discussion of software development methodology. Prerequisite: 370.

480—Computer Networks II (3). In-depth analysis and evaluation of computer networking architectures, protocols and algorithms, network security, distributed data base and computational networks, routing and congestion control, domains and internetworking. Prerequisite: 380.

490—Research (cr. arr.). Graduate thesis research. Prerequisite: departmental consent.

Consumer and Family Economics

College of Human Environmental Sciences
238 Stanley Hall (314)882-6870

FACULTY

Edward J. Metzen, chairman, professor, EdD, University of Missouri-Columbia

Eunice Lieurance, associate professor, MS, Michigan State University

Robert O. Weagley, associate professor, PhD, Cornell University

Melchior J. Zelenak, associate professor, PhD, University of Iowa

Craig L. Israelson, assistant professor, PhD, Brigham Young University

Michele Merfeld, assistant professor, PhD, Oregon State University

Barbara J. Slusher, assistant professor, PhD, University of Missouri-Columbia

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 independent study and selection of courses 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 service institutions, consumer journalism and other positions in business and public institutions. The PhD degree qualifies students for teaching and research at the university level and for other research or administrative positions.

See **Human Environmental Sciences** in this section for general information.

Additional information may be obtained from the Director of Graduate Studies, Department of Consumer and Family Economics, 238 Stanley Hall, Columbia, Mo. 65211.

COURSES

300—Problems (cr. arr.). Supervised and independent work. Prerequisites: a 100- or 200-level course in field of problem, senior standing and instructor's consent.

318—Topics (cr. arr.) Selected current topics in field of interest.

350—Readings (cr. arr.). Prerequisite: two to three hours in subject.

355—Recent Trends (1-3). For upperclass and graduate students who wish additional knowledge and understanding in specific subject matter areas. Prerequisites: upperclass or graduate standing.

370—Housing the Family (3). Planning housing for families with emphasis on family composition, interests, activities and socioeconomic status. Consideration of environment, plans

and space requirements which promote efficient utilization of family resources for attainment of maximum satisfactions. Prerequisite: junior standing.

372—Family Values and Resource Management (2). Consideration of differing value systems of families, impact of values on family resource allocation and resulting lifestyles. Effects of mass media and current social movements on values. Prerequisites: 72, 173, and junior standing recommended.

373—Financial Problems of the Individual and Family (3). Individual and family problems involving finances. Analysis of financial planning, saving and investment media, credit, taxes and insurance. Prerequisite: 173.

374—Use and Care of Home Equipment (3). Experience in use and care of appliances for food preparation, laundering and cleaning. Prerequisites: 174 and a foods course. Recommended: textiles and apparel management course.

375—The Consumer and the Market (3). Economic systems and role of consumers, marketing practices, consumer behavior and problems, legislation. (No credit for students who have completed 175.) Prerequisites: graduate standing and introductory economics course.

376—Management of Financial Resources (3). Analysis of elements and principles of family finance, with application to case problems, impact of general economic conditions on families and principles and processes of financial counseling. Prerequisites: 173 or 373 and an introductory economics course.

377—Economics and the Consumer (3). Consumption as an economic activity, theory of consumer choice, consumer implications of various market structures and economic policies affecting consumer interests. Prerequisite: 175 or 375.

378—Effective Consumer Decision-Making (3). Theory, concepts and principles underlying consumer decision-making, including rationality, uncertainty, optimal search, heuristics, interactive decisions and strategies for their application in the marketplace. Prerequisites: 175 and Economics 51.

379—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: 175 and Management 254.

390—Field Training (cr. arr.). Prerequisites: junior standing and instructor's consent.

400—Problems (cr. arr.). 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—Research Methods in Family Economics (3). Introduction to the scope, purpose and methods of research in family economics, with emphasis on economic survey methods. Prerequisites: graduate standing and an introductory statistics course (Sociology 375 or Statistics 207).

415—Readings (cr. arr.).

418—Topics (cr. arr.). Selected current topics in field of interest.

450—Research (cr. arr.). Independent research not leading to a thesis. Report required.

473—Family in the Economy (3). Analyzes the family as an economic unit. Standards, levels of living. Examines determinants, significance of family income and wealth. Policies and programs affecting family income. Prerequisites: graduate standing, 376, 377, and an introductory economics course.

475—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: introductory economics, 473 or instructor's consent.

476—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 and consideration of underlying philosophies and policy alternatives. Prerequisites: 377 or instructor's consent.

490—Research (cr. arr.). Independent research leading to thesis or dissertation.

Curriculum and Instruction

College of Education
212 Townsend Hall (314)882-6572

FACULTY

Wayne Dumas, chairman, professor, EdD, University of Arkansas

Larry A. Kantner, director of graduate studies, professor, EdD, Pennsylvania State University

Lloyd Barrow, professor, PhD, University of Iowa

James L. Craigmile, professor, EdD, University of Nebraska

Thomas L. Good, professor, PhD, University of Indiana

Douglas A. Grouws, professor, PhD, University of Wisconsin-Madison

Peter Hasselriis, professor, PhD, University of Syracuse

Ben F. Nelms, professor, PhD, University of Iowa

Stuart Palonsky, professor, PhD, University of Minnesota

Robert F. Reys, professor, EdD, University of Missouri-Columbia

Richard D. Robinson, professor, EdD, University of Georgia

Cary T. Southall, professor, EdD, University of Florida

Dorothy Watson, professor, PhD, Wayne State University

Betty M. Burchett, associate professor, EdD, University of Indiana

Lonnie Echternacht, associate professor, EdD, University of Missouri-Columbia

Adrienne Hoard, associate professor, PhD, University of Illinois

Stevie Hoffman, associate professor, PhD, University of Florida

Linnea Lilja, associate professor, PhD, University of Minnesota

Mary M. McCaslin, associate professor, PhD, Michigan State University

Barbara Reys, associate professor, PhD, University of Missouri-Columbia

John Wedman, associate professor, PhD, Oklahoma University

Judith Wedman, associate professor, PhD, Oklahoma University

Martin Bergee, assistant professor, PhD, University of Kansas

Lois Bryant, assistant professor, PhD, University of Missouri-Columbia

Nancy Knipping, assistant professor, PhD, Southern Illinois University

Wendy Sims, assistant professor, PhD, Florida State University

Diane vomSaal, assistant professor, PhD, University of Texas

DEGREES: MA or MEd in curriculum and instruction with the following emphasis areas: art education, early childhood education, elementary education, educational technology, English education, foreign language education, mathematics education, music education, reading education, science education, secondary education and social studies education; and EdSp, EdD or PhD in curriculum and instruction with the following emphasis areas: art education, curriculum and instruction, early childhood education, educational technology, elementary education, English education, foreign language education, mathematics education, music education, reading education, science education, secondary education, or social studies education.

Graduate study in curriculum and instruction prepares teachers, curriculum leaders and teacher educators for professional excellence. With the rapid changes in education — especially new 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, technology specialists, curriculum coordinators, supervisors of instruction, department chairmen and chairwomen, leaders of in-service education, or teacher educators. Graduate programs in curriculum and instruction are designed to prepare the professionals for these new roles.

See **Education** for general information.

Additional information may be obtained from the Director of Graduate Studies, Department of Curriculum and Instruction, 209 Townsend Hall, Columbia, Mo. 65211.

COURSES

T213—Teaching of Speech in the Secondary School (5). Techniques in teaching and evaluating speech and dramatics in secondary schools. Prerequisites: Educational and Counseling Psychology A205 and professional standing.

T230—Art Activities in the Elementary School (2). Considers the vital role of art activities and creative experiences in the growth and development of children. Prerequisite: professional standing.

T233—The Structure of the Secondary Art Curriculum (2) (same as Educational and Counseling Psychology A205). Principles of curriculum development and their application to art education. Includes art education philosophies and rationales and their relationship to organization, schedules and programs of secondary schools. Prerequisite: Educational and Counseling Psychology A205.

T234—Secondary Art Education Methods (2). Studio and related experiences in the middle/junior and senior high school. A study of instructional methods and of materials and media appropriate to art education.

T250—Special Readings (1-3). Directed study of literature and research reports in education. cor.

T251—Teaching of Social Studies in the Secondary School (5). Techniques in teaching and evaluation of social studies in secondary schools. Prerequisites: Educational and Counseling Psychology A205 and professional standing.

T255—Elementary School Music (2). Pragmatic approaches in the development of concepts, knowledge and skills essential for music instruction within the elementary school curriculum. Required for early childhood and elementary education majors. Prerequisites: Music 8, 12, 18 or competency, Educational and Counseling Psychology A205 and professional standing.

T256—Music Literature for Children (3). Study and survey of music literature and instructional teaching/learning materials for the comprehensive elementary school curriculum. Required for elementary music education majors. Prerequisite: T255 or T257 or equivalent.

T257—Teaching Music in the Elementary School (3). Study of concepts, materials and evaluation in teaching/learning procedures for music instruction in the comprehensive elementary school music program. Prerequisites: Educational

and Counseling Psychology A205 and junior standing or instructor's consent.

T258—Teaching of Secondary School Music (3). A study of the various components for the teaching of a comprehensive secondary school music program. Prerequisites: Educational and Counseling Psychology A205 or instructor's consent and professional standing.

T267—Teaching Mathematics in the Elementary School (3). Instructional strategies and contemporary resource materials for the successful development of selected concepts and skills in elementary school mathematics programs. Prerequisites: Mathematics 7 and 8, professional standing.

T268—Teaching of Mathematics in the Secondary School (3). Techniques in teaching and evaluation of mathematics in the secondary schools. Prerequisites: Educational and Counseling Psychology A205 and professional standing.

T271—Production and Use of Instructional Media (1). Demonstrations and laboratory exercises in the preparation and use of audio-visual materials for teaching.

T280—Teaching Second Languages (5). Course presents second or foreign language teaching methods appropriate to K-12 and practice and critique of those methods. Prerequisite: Educational and Counseling Psychology A205.

T299—Student Teaching (cr. arr.). Hours and credit must be arranged with director of student teaching. Must apply during February for following year. Prerequisites: T240 and special methods courses in area of specialization.

T301—Child Study (3). Presents physical, mental, social and emotional aspects of the child from birth through age eight, with implications for program and curriculum planning.

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. Prerequisite: T301 or Educational and 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 and professional standing.

T306—Assessment in Early Childhood Education (3). Development 160 and Educational and 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, Human Development and Family Studies 160 and Educational and Counseling Psychology A205.

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. Prerequisite: junior standing or instructor's consent.

T310—Seminar in Curriculum and 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 and 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 and methods used in teaching reading in elementary grades. Prerequisites: Educational and Counseling Psychology A205 and professional standing.

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 and 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.

T324—Teaching of Science in the Secondary School (5). Techniques in teaching and evaluation of science in the secondary schools. Prerequisites: Educational and Counseling Psychology A205 and professional standing.

T332—Organization of Public School Art (2). Purposes and practices of art experiences in elementary and secondary schools. Designed for teachers, supervisors and administrators.

T350—Social Studies in the Elementary School (3). Problems in preparation, teaching of units with suitable materials, techniques. Prerequisites: Educational and Counseling Psychology A205 and 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. Prerequisite: music methods or instructor's consent.

T366—Diagnosis and 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 and Use of Instructional Media Materials (3). Development of skills in the production and use of various forms of educational media technologies.

T373—Photography for Teachers (3). Basic 35mm photography techniques and processes; basic darkroom; photo publications; basic slide/tape production as they apply to educational settings.

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.

T376—Instructional Television (3).

T377—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. Prerequisite: teaching experience or instructor's consent.

T378—School Learning Resource Centers (3) (same as Library Science 342).

T400—Problems (cr. arr.).

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—Early Childhood Research-Based Curriculum Models (3). Selected research-based curriculum models in early childhood education; study of home-based, center-based models; experiments in primary education; theoretical and philosophical differences. Prerequisite: learning or child development course 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, pre-kindergarten through early primary grades. Prerequisite: teaching experience or instructor's consent.

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. Prerequisite: T309 or instructor's consent.

T410—Seminar in Curriculum and Instruction (1-3).

T411—Studies in English Education (3) (same as English 411).

T412—Elementary Language Arts Curriculum (3). Advanced study of language arts curricula, including curriculum models, curriculum design and construction, concomitant instructional methods and evaluation. Prerequisite: undergraduate language arts methods course or instructor's consent.

T414—Instructional Materials in Reading and Language Arts (3). Studies and investigations of types of instructional materials for developmental, corrective and remedial reading.

T415—Practicum in Child Study I (3-5). Practicum experiences in diagnosing educational problems of school children. Prerequisites: T315 or T316, T318 and Educational and 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 and T416.

T418—Reading Miscue Analysis (3). The process in which readers construct meaning by relating their sociopsycholinguistic backgrounds to discourse. Fifteen studied miscues (text deviations) are analyzed at several linguistic levels. A comprehension centered reading program is developed. Prerequisite: T315 or T316, or equivalent.

T419—Analysis and Correction of Reading Disabilities (3). Diagnostic and corrective procedures in reading instruction that may be used for clinical study. Prerequisite: 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 and 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 438).

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 and measurements from points of view of teachers, supervisors and 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 and superintendents. Present trends in curricula and methods of investigating curricula.

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.

T447—Improvement of Instruction (3). Study of recent developments in instruction and instructional improvement programs appropriate to teachers, principals, curriculum directors and superintendents with considerable preparation in education and teaching experience.

T448—Analysis of Instructional Behavior (3) (same as Educational and Counseling Psychology A448). 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—Classroom Discipline and Interpersonal Relations (3). Designed for elementary and secondary teachers and administrators. Deals with a variety of responses to discipline problems, uses critical incidents to identify and illustrate their distinguishing characteristics and provides small group practice opportunities.

T450—Patterns for Instruction in Social Studies (3). Presents and evaluates strategies for planning, teaching and evaluating social studies in elementary and secondary schools. Recommended/Prerequisite: T351.

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.

T459—Teaching Vocal Music (3). Studies in voice development techniques and the organization of choral programs.

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.

T468—Secondary Mathematics Curriculum and Teaching (3). Discussion and application of theories of learning, strategies of instruction, curriculum development, evaluation techniques and research to secondary mathematics programs. Prerequisite: mathematics secondary school teaching experience or equivalent.

T470—In-Service Course in Curriculum and Instruction (cr. arr.). Course work adapted to current vocational needs. Prerequisite: instructor's consent.

T471—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. Prerequisite: course in curriculum and instruction or instructor's consent.

T472—Review of Research in Educational Technology (3). Examination of research related to the design, development, use and evaluation of educational technology software and processes. Prerequisite: T471 or instructor's consent.

T475—Diffusion of Educational Innovations (3). Indepth analysis of innovation development and adoption processes in educational organizations, including schools, universities, and training centers.

T480—Internship in Curriculum and Instruction (cr. arr.). Provides internship experience under supervision in advanced levels of curriculum and instruction. Prerequisite: departmental chairman's consent.

T490—Research in Curriculum and Instruction (cr. arr.).

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. A pilot study will be required. Prerequisite: R370 or equivalent.

Economics

College of Arts and Science
118 Professional Building (314)882-4574

FACULTY

Carmen F. Menezes, chairman, professor, PhD, Northwestern University

Maw Lin Lee, director of graduate studies, professor, PhD, University of Wisconsin

John P. Bigelow, director of undergraduate studies, assistant professor, PhD, University of Pennsylvania

Floyd Harmston, professor emeritus, PhD, University of Missouri-Columbia

W. Whitney Hicks, professor, PhD, Stanford University

David J. Loschky, professor, PhD, Harvard University

Ronald A. Ratti, professor, PhD, Southern Methodist University

David W. Stevens, professor, PhD, University of Colorado

Charles G. Geiss, associate professor, PhD, University of North Carolina

Walter L. Johnson, associate professor, PhD, Duke University

Neil Raymon, associate professor, PhD, University of Colorado

Donald J. Schilling, associate professor, PhD, University of North Carolina

Francis K. Cheung, assistant professor, PhD, Michigan State University

Siddhartha Chib, assistant professor, PhD, University of California-Santa Barbara

Karen Hallows, assistant professor, PhD, University of Nebraska

Suezo Ishizawa, assistant professor, PhD, Johns Hopkins University

Kiseok Lee, assistant professor, PhD, University of Chicago

Peter Mueser, assistant professor, PhD, University of Chicago

Shawn Ni, assistant professor, PhD, University of Minnesota

Xinghe Wang, assistant professor, PhD, University of Iowa

DEGREES: MA and PhD in economics

The Department of Economics offers graduate work leading to the master of arts and the doctor of philosophy. The program prepares students for careers in government, business, 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.

Areas of specialization are econometrics, economic demography, economic development, economic education, economic history, economic theory, industrial organization, international economics, labor economics, monetary economics, public economics, utilities and regulated industries. Summaries of the subject matter for a few of these areas follow.

Econometrics is designed for students who are interested in the theory and practice of statistical inference relating to economic models. Topics covered include the formulation, specification and estimation of single and multiple equation models, elements of computer usage, non-linear econometric systems, simulation and forecasting.

Industrial Organization applies microeconomic theory to evaluate the structure, conduct and performance of different markets. Course work in this area emphasizes the determinants of, and links between, these market dimensions. Topics include strategic interaction among firms in imperfectly competitive markets, the rationale for and practice of antitrust policy, natural monopoly, Ramsey prices, contestable markets and regulation.

Labor Economics emphasizes analysis of the

relevance of economic concepts to an understanding of such labor market phenomena as wage structure discrimination, human capital formation, utilization of human resources and governmental intervention strategies.

Monetary Economics studies concentrate on the role of various institutional arrangements and the operations of credit markets, the consequences of specific changes in banking structure and the welfare aspects of these changes.

Public Economics area includes public choice, the determination of the amounts and types of public goods to be provided, externalities, the efficiency of government spending and the impact of taxation upon resource allocation and income distribution.

Economic Education is for students who have a strong interest in teaching economics. Research in economic education focuses on the effectiveness and efficiency of alternative teaching and learning methods.

Applicants for graduate study in economics should write the Director of Graduate Studies, Department of Economics, 118 Professional Building, Columbia, Mo. 65211 for specific information about the graduate program and application forms for teaching and research assistantships.

Admission forms for Graduate School may be obtained directly from the campus Admissions Office or through the department. March 1 is the deadline for applications for assistantships for the school year beginning in August, but earlier submissions are desirable. (The department nominates superior applicants for fellowships available on a campuswide competitive basis. The deadline for nominations is mid-January.) Late applications will be accepted, subject to the availability of openings and funds. Admission may be granted at any time to qualified students.

MASTER'S DEGREE: The department encourages application from anyone who is interested in graduate study in economics. A bachelor's degree in any field, a GPA of 3.0 (A=4.0) in the last two years and an adequate GRE general test score comprise minimum requirements for admission. Individuals accepted at the minimal requirements level will be assigned special support course work, some or all of which can be counted toward the MA degree. The verbal, quantitative and analytical sections of the GRE are required for admission. TOEFL scores also are required of those applicants whose native language is not English.

To fulfill requirements for the MA degree, a candidate must complete a 34-hour approved program of study. This includes 19 credit hours of core courses: 370 (mathematical economics), 405-406 (microeconomics), 453 (macroeconomics), and 472-473 (econometric methods). In addition, students must enroll in the MA research workshop (413). Of the remaining 12 elective hours, six must be chosen from among 400-level courses in the Department of Economics (except 402, 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. 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 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 non-thesis option.

As a final option, the student can earn an MA while working toward a PhD by passing the comprehensive examinations.

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 definite 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 economics, 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 and 451-452 (microeconomics); 453-454 (macroeconomics); 472-473 (econometric methods); 413 Research Workshop I, and two credit hours of 423 Research Workshop II; six credit hours of 400-level economics courses in each of two areas of specialization among those listed above; two other 400-level economics courses (excluding 400 and 490); nine additional credit hours of elective course work within the Department, or courses 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.

Examinations: Upon completion of relevant required courses, normally after two years in the program, students take a qualifying examination, consisting of three written examinations, in microeconomic theory, macroeconomic theory, and econometrics. Students who fail one or more exams are permitted to take failed exams a second time. Subject to approval by the director of graduate studies in economics, a third attempt may be permitted for any exam.

The comprehensive examination, normally taken in the third year or at the beginning of the fourth year of study, consists of written examinations in the student's two major areas of specialization. These examinations are normally four hours in length and are 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 of these exams are automatically permitted to take them a second time; a third attempt is permitted subject to approval by the department and the Graduate School.

Proposal Hearing: A student must prepare a dissertation research proposal and defend it in a hearing before a doctoral program committee. The dissertation research proposal will include a statement of the problem, the hypotheses to be tested; a literature review, complete with references; a discussion of the applicable economic models and testing procedures; the method of analysis; and probable data sources. A dissertation outline is highly desirable. Requirements will vary, depending upon the nature of the problem. Exact content of the proposal shall be subject to approval by the student's adviser.

A **dissertation** must be written on a subject approved by the student's committee, and it must make a substantial contribution to knowledge in the area in which it is written.

The final examination shall be oral and shall include an evaluation of the dissertation, the student's defense of the dissertation and the student's general comprehension of economics.

COURSES

229—Money and Banking (3). American monetary and banking systems and their influence on economic activities. Prerequisites: 1 and 2 or 41 or 51.

231—Economic Analysis for Journalists (3) (same as Journalism 231). Enrollment restricted to students in the School of Journalism. An analysis of the application of theory to current economic problems and the development of economic institutions. Prerequisites: 1 and 2 or 41 or 51.

232—Microeconomics for Managers (3). Microeconomic concepts, theory and methods as tools of analysis for management. Prerequisite: graduate standing or instructor's consent. Not open to undergraduate majors or graduate students in economics.

233—Macroeconomics for Managers (3). Measurement of economic activity; determinants of national income and investment; forecasting national income; money, prices and inflation; monetary and fiscal policy. Not open to undergraduate majors or graduate students in economics. Prerequisite: 232 or instructor's consent.

251—Theory of the Firm (3). Introduces price theory and the economics of the firm. Prerequisites: 1 and 2 or 41 or 51.

256—Economics of Public Policy: Antitrust Economics (3). Competition and monopoly and their roles in the American economy. Prerequisites: 1 and 2 or 41 or 51.

271—Introduction to Applied Econometric Practice (3). Introduction to econometric technique. Computer-based applications to economic data. Review of probability, statistics, and simple regression. Multiple regression, dummy variables and distributed lags. Econometric problems: heteroscedasticity, autocorrelation, multicollinearity. Prerequisites: 1 and 2 or 51 and Statistics 150.

298—Honors Proseminar (2-3). An introduction to research techniques in economics. Prerequisite: senior economics majors who are eligible for honors courses or who have maintained at least a B average in all economics courses.

299—Honors Proseminar (2-3). Research for graduation with honors in economics. Prerequisite: 298.

300—Problems (cr. arr.). 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 five hours. Prerequisite: instructor's consent.

311—Labor Market, Employment and Wages (3). Surveys theoretical explanations of wage and employment determination in contemporary labor markets. Prerequisite: 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. Prerequisites: 251 or 351, and 210 or 311 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. Prerequisite: 251 or 351.

316—State and Local Finance (3). State and local tax and expenditure problems, intergovernmental fiscal relations, problems of metropolitan areas. Prerequisite: 251 or 351 or instructor's consent.

320—Introduction to Economic Doctrines (3). Origins of modern economic thought in the context of social and intel-

Economics

lectual environment of the time in which they originated, their contribution to their period and to modern thought. Prerequisites: 1 and 2 or 41 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. Prerequisite: 351 or 251.

325—The International Monetary System (3). Study of macroeconomic and monetary relationships between the United States and the world. Topics include balance of payments, foreign exchange rates and 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. Prerequisite: 251 or 351.

329—The Banking System and the Money Market (3). Organization of the money market and credit control procedures and aims, effect of bank expansion and contraction on money market and national income deregulation. Prerequisite: 229.

351—Intermediate Price Theory (3). Analyzes influences underlying economic value. The pricing process under various market conditions considered. The functioning of enterprise system evaluated. Prerequisites: 1 and 2 or 41 or 51 and Mathematics 61 or 80 or 108.

353—Intermediate Income Analysis (3). National income concepts, national income accounting and theory of income determination. Prerequisites: 229 and Mathematics 61 or 80 or 108.

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. Prerequisite: 251 or 351.

360—Economic Development(3) (same as Peace Studies 360). Process of economic development examined. Structural transformation of the economy analyzed, with problems of backward economies highlighted. Prerequisites: 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 comparison; cardinal and ordinal utility; Pareto optimality; conflicts of interest and distribution of income; and individual values and social choice. Prerequisite: 351.

368—Business Fluctuations (3). Definition and analysis of trends in economic activity, business cycle theory, introduction to forecasting and policy for control. Prerequisite: 229.

370—Introduction to Quantitative Economics (4). Introduction to the mathematical language of economic theory. Topics include multivariate calculus, introductory linear algebra, optimization, dymanic analysis, and stability. Prerequisite: Mathematics 80 or equivalent 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: 351.

398—Senior Seminar in Economics (3). (Not open to nonmajors) Seminar for graduating seniors who are majoring in economics. Multiple writing assignments will emphasize synthesis of theoretical, empirical and institutional economics.

399—Independent Study (cr. arr.). Individual work, with conferences adjusted to needs of student. Prerequisite: instructor's consent.

400—Problems (cr. arr.). Graduate students may select topics for study and investigation from fields suggested by undergraduate courses listed above.

401—Topics in Economics (3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

402—Problems in Economic Education (1). Seminar devoted to methods of increasing the effectiveness of the teacher of economics. Course required for graduate students in the first year of teaching.

405—Advanced Price Theory I (3). Microeconomic models developed and applied to economic events using rigorous but non-technical methods. The prerequisite mathmatical knowledge is elementary algebra, analytical geometry and one dimensional calculus. Undergraduate economics training is assumed.

406—Advanced Price Theory II (3). Continues Advanced Price Theory I by introducing intermediate quantitative methods as the language of analysis. Prerequisites: 370 or equivalent, and 405.

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 and at least concurrent enrollment in 406.

412—Workshop in Labor Economics (3). Applications of contemporary analytical techniques to labor market topics chosen by the instructor. Prerequisites: 405 and at least concurrent enrollment in 406.

413—Research Workshop I (3). Combines instruction and student presentations to introduce research methods and practice. A major research paper is required. Prerequisites: 405 and 406; or instructor's consent.

415—Advanced Public Economics I (3). Public goods, the socialization of private commodities, externalities, public choice and cost-benefit analysis. Prerequisites: 405 and at least concurrent enrollment in 406.

416—Advanced Public Economics II (3). Sources of public revenues, efficiency and equity in taxation, tax incidence in a general equilibrium setting, optimal taxation and income distribution. Prerequisites: 405 and at least concurrent enrollment in 406.

420—History of Economic Thought (3). Analysis of development of economic theory; emphasis on evaluation of classical doctrine. Prerequisites: 405 and at least concurrent enrollment in 406.

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. Prerequisite: 413 or consent of director of graduate studies.

425—International Finance (3). International monetary theory and macroeconomic equilibrium in open economies. Prerequisites: 353 or equivalent; 405 and at least concurrent enrollment in 406.

426—International Trade (3). Pure theory of international trade and commercial policy. Prerequisites: 405 and at least concurrent enrollment in 406.

430—Advanced Money and Banking (3). Theories of determination of quantity of money and influence of money and near-money on income and prices. Theories explaining level and structure of interest rates. Prerequisites: 405 and at least concurrent enrollment in 406, 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 at least concurrent enrollment in 406, and 472.

451—Advanced Microeconic Theory I (3). Introduction to the axiomatic foundations of microeconomic theory. Topics include preference relations, demand, production and cost functions, dual approaches to the consumer and firm, decision theory and general equilibrium. Prerequisite: 406.

452—Advanced Microeconomic Theory II (3). Focuses on models of incomplete and asymmetric information, and game theory. Topics include the Nash equilibrium and refinements, and cooperative solution concepts. Prerequisite: 451.

453—Advanced Income Analysis (3). Aggregate models of macroeconomic fluctuations and growth. Prerequisites: 353 or equivalent; 405 and at least concurrent enrollment in 406.

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. Prerequisites: 405 and at least concurrent enrollment in 406.

456—Seminar in Public Utility Regulation (3). The rationale for and policies toward regulated monopolies. Includes the theory of natural monopoly, Ramsey prices, contestable markets and sustainability. The economics of regulation, deregulation and reregulation will be discussed. Prerequisites: 405 and at least concurrent enrollment in 406.

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 occurrence. Prerequisites: 405 and at least concurrent enrollment in 406, and 472.

470—Mathematical Economics I (3). Application of mathematical tools to advanced economic analysis. Prerequisites: 370 and 451.

471—Mathematical Economics II (3). Continuation of 470. Prerequisite: 370 and 451.

472—Econometric Methods I (3). Constructing economic models and econometric techniques used in estimating associated behavioral relationships. Prerequisites: graduate standing and consent of director of graduate studies, or instructor.

473—Econometric Methods II (3). Continuation of 472. Prerequisite: 472.

474—Advanced Seminar in Econometric Methods (3). Covers methods important in current applied economic research, with the focus on practical issues associated with the use of modern econometric methods. Topics to be determined by instructor. Prerequisites: 472 and 473.

475—Advanced Econometrics I (3) (same as Agricultural Economics 475). Formal treatment of single equation regression models from the likelihood and Bayesian perspective. Emphasis given to special estimation problems that occur in integrating the theory with various types of economic data. Prerequisites: 472, 473, Statistics 325 and 326, or instructor's consent.

476—Advanced Econometrics II (3) (same as Agricultural Economics 476). A continuation of the material in 475 to dynamic and simultaneous equation models. Topics considered include non-linear econometric systems, random parameter models, specification searches and prediction. Prerequisite: 475 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 PhD 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 and at least concurrent enrollment in 406.
490—Research (cr. arr.). Thesis research for MA or PhD degree.

Education

College of Education
109 Hill Hall (314)882-8311

FACULTY

Wilbur R. Miller, dean, director of graduate studies, professor, EdD, University of Missouri-Columbia
Jo Behymer, associate dean, associate professor, EdD, University of Missouri-Columbia
Charles D. Schmitz, associate dean, assistant professor, PhD, University of Missouri-Columbia

GRADUATE PROGRAMS in education are coordinated by the College of Education and administered by the following departments in the college:

- Curriculum and Instruction
- Educational Administration
- Educational and Counseling Psychology
- Health and Physical Education
- Higher and Adult Education and Foundations
- Practical Arts and Vocational-Technical Education
- Special Education

The departments 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 department under the individual fields of study.

ENTRANCE REQUIREMENTS: All graduate students in education are required to take the standardized test or tests (Miller Analogies Test or GRE) designated by the department. The examination should be taken before acceptance. Some departments may allow the test to be taken during the first session of enrollment.

An individual admitted to a program leading to the degree of master of education (MEd) 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 department. 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
- 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 department. 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 Admissions, 130 Jesse Hall, Columbia, Mo. 65211, at least 60 days prior to the initial enrollment. Some departments set more stringent deadlines. The student who fails to apply prior to this deadline may be admitted conditionally, pending determination of qualifications.

To be accepted for advisement for the MEd or the MA in education, an applicant must have acceptable scores on the required examinations and an undergraduate GPA of at least 3.0 (A=4.0) or the equivalent during the last two years of undergraduate work. However, a student with an undergraduate GPA of between 2.2 and 3.0 will be considered for probationary acceptance if other background information or circumstances indicate likelihood of success.

MEd 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. 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 or offered through the Center for Independent Study by MU faculty. Transfer credit must be approved by the student's adviser and the dean of the Graduate School. Course work taken through the Center for Independent Study must have the approval of the dean of the Graduate School before enrolling in the course. No more than 15 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.

Over and above 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 and one course in the social, philosophic or historic foundations of education or one foundations course in the behavioral sciences. The program of study also must contain a course that enables the student to read, interpret and evaluate reports in educational research.

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.

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. 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. No more than 15 semester hours of course work taken at MU while in the unclassified or post-baccalaureate 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.

The program of study for the MA emphasizes research and must include a course in educational statistics and one course in the social, philosophic or historic foundations of education or one foundations course in the behavioral sciences.

For an MA with a thesis (Plan A), a course in methods of research and three to six semester hours of 490 Research are required. The non-thesis MA (Plan B) requires departmental acceptance of a completed research project presented in the form of 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 non-thesis MA degree.

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.

A candidate for the degree submits a program of study to a committee of three faculty, the department, the divisional director of graduate studies and the dean of the Graduate School. The program is directed by an advisory committee and supervised by the major adviser.

Evidence of proficiency in the areas of educational statistics and research methodology must be provided before the candidate's final examination. This evidence will normally be the satisfactory completion of R370 and R409. If not completed as a part of the master's degree, the program must include a graduate course in the behavioral, social, philosophic or historical foundations of education. The program may consist entirely of courses in education or, in part, of courses selected from other disciplines, so long as a minimum of 15 semester hours are in education. 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 unclassified or post-baccalaureate 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 post-master's degrees. A maximum of six semester hours of course work offered through the Center for Independent Study by MU faculty may be used, but courses must have the approval of the adviser and the dean of the Graduate School before enrolling in the courses. Off-campus courses offered by MU faculty may be included in the EdSp program. Eight semester hours must be completed after the program of study has been approved. 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. 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.

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 Special EdD Degree Regulations under Doctoral Degrees.

The program of study, determined by the major adviser in cooperation with a doctoral program committee, is a well-organized plan of professional specialization in one of the major fields of education. A minimum of 82 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 major adviser and the dean of the Graduate School, graduate work completed in other institutions with recognized graduate schools may be accepted toward the degree requirements.

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 department. 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 MEd 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. Consult the divisional 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 final 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.

Before admittance to 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 shall have demonstrated competence at the level of a grade of B or higher in the courses Educational Statistics I and II, and Foundations of Educational Research. Foreign language is not required unless the candidate's program committee decides otherwise.

A final oral examination on work included in the dissertation also is required. This examination is conducted by the major adviser and the program committee.

PhD IN EDUCATION: 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.

A minimum of 72 semester hours above 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.

A comprehensive examination must be taken no earlier than the second year of graduate work. Prior to the examination, candidates for the PhD in education must demonstrate competence in the area of research by earning grades of "A" or "B" in the following courses (or their equivalents) Educational Statistics I, Educational Statistics II, Foundations of Educational Research and one research elective course. Exceptions to one or more of the research foundation courses (for specific applications) must be approved by the divisional director of graduate studies. 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.

Neither languages nor language substitutes are required for the PhD in education. Instead, the College of Education requires a research support area. Competence must be demonstrated in a support area in an MU department or academic area other than education by:

- completing a minimum of 12 semester hours of credit with a GPA of 3.0 or better in courses approved by the program committee or
- acceptable performance on an examination administered by the department offering the support area

The research support area shall be formulated as complementary to research in the major area of specialization. The research support area shall provide a command of specialized research techniques or be relevant to theoretical concepts that will provide added depth and structure to research in the area of specialization.

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.

Educational Administration

College of Education
211 Hill Hall (314)882-8221

FACULTY

Roger D. Harting, chairman, director of graduate studies, professor, EdD, University of Missouri-Columbia

James L. Craigmile, professor, EdD, University of Nebraska

Richard V. Hatley, professor, EdD, University of New Mexico

Robert H. Reifschneider, professor, EdD, University of Nebraska

Robert C. Shaw, professor, EdD, University of Missouri-Columbia

Jerry Valentine, professor, PhD, University of Nebraska

DEGREES: MEd in educational administration with the following emphasis areas: elementary school administration and supervision, general school administration and supervision, and secondary school administration and supervision; and EdSp, EdD or PhD in educational administration with the following emphasis areas: administration and supervision of special education, elementary school administration and supervision, general school administration and supervision or secondary school administration and supervision.

The Department of Educational Administration offers graduate programs designed to prepare individuals for educational leadership positions. Department graduates hold positions such as principals, superintendents, instructional coordinators (department chairmen, supervisors and team leaders), school public relations officials, school business managers, governmental and private agency leaders, college administrators and professors of educational administration. The department attempts to structure each program within degree requirements to meet individual interests and needs, including state certification requirements for administrators.

See under **Education** for general information.

Additional information may be obtained from the Director of Graduate Studies, Department of Educational Administration, 211 Hill Hall, Columbia, Mo. 65211.

COURSES

C242—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: departmental consent.

C360—Topics in Educational Administration I (cr. arr.). Group experiences in educational administration for undergraduate and master's students.

C390—Foundations of Educational Administration (2-3). Surveys the field of educational administration. Designed to serve as a foundation for more specialized courses. Emphasizes history and development of administrative theory.

C400—Problems (cr. arr.).

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, supervisors and teachers, including attention to services for exceptional children, 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 districtwide administrators. Local, state and federal

regulations and administrative aspects of finance, school plant, staff personnel and pupil personnel, including people who are mentally and physically 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 mentally and physically handicapped. Aspects of school finance and elements of the school evaluation process also are 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 and 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.

C440—Issues in School Finance (2-3). Exploration of the social, political, economic and educational issues that 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.

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 (cr. arr.). Group experiences in educational administration. For graduate students only.

C470—Field Experience in Educational Administration (0-9.9). 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 (cr. arr.).

Educational and Counseling Psychology

College of Education
16 Hill Hall (314)882-7731

FACULTY

Michael J. Patton, chairman, professor, PhD, The Ohio State University

Dennis M. Kivlighan Jr., director of graduate studies, assistant professor, PhD, Virginia Commonwealth University

Donn E. Brolin, professor, PhD, University of Wisconsin-Madison

Richard B. Caple, professor, EdD, Teachers College, Columbia University

Richard A. English, professor, PhD, University of Arizona

Norman C. Gysbers, professor, PhD, University of Michigan

Joseph A. Johnston, professor, PhD, University of Michigan

James R. Koller, professor, PhD, University of Missouri-Columbia

David D. McIntire, professor, EdD, West Virginia University

Charles Schmitz, professor, PhD, University of Missouri-Columbia

Richard W. Thoreson, professor, PhD, University of Missouri-Columbia

Mary McCaslin, associate professor, PhD, Michigan State University

Steven J. Osterlind, associate professor, PhD, University of Southern California

Hope I. Hills, assistant professor, PhD, Virginia Commonwealth University

CarolAnne M. Kardash, assistant professor, PhD, Arizona State University

Richard T. Lapan, assistant professor, PhD, University of Utah

Leslie Eastman Lukin, assistant professor, PhD, University of Nebraska

Karen D. Multon, assistant professor, PhD, Loyola University of Chicago

C. David Roberts, assistant professor, PhD, University of Arizona

John R. Small, assistant professor, PhD, University of Missouri-Columbia

Carl G. Willis, assistant professor, EdD, Oklahoma State University

DEGREES: MA, MEd, EdSp or PhD in educational and counseling psychology with the following emphasis areas: counseling psychology (APA approved), educational psychology and school psychology.

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 under **Education** for general information.

Additional information may be obtained from the Department of Educational and Counseling Psychology, 16 Hill Hall, Columbia, Mo. 65211.

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. Prerequisite: Psychology 1 or 2.

A207—Child Development (2). The psychological, intellectual, social and physical development of children. Prerequisite: Psychology 1 or 2.

A208—Adolescent Development (2). The psychological, intellectual, social and physical development of adolescents. Prerequisite: Psychology 1 or 2.

A280—Educational Measurement (2). Basic concepts of standardized testing, evaluation techniques and interpretation of test scores for the improvement of the instructional process. Prerequisite: Psychology 1 or 2.

A300—Problems (1-3). Prerequisite: instructor's consent.

A301—Foundations of Educational Psychology (3). A survey course covering learning, development and measurement. Prerequisite: Psychology 1 or 2.

A310—Seminar (1-3). Prerequisite: instructor's consent.

A315—Human Learning (3). An introduction to the basic principles of learning. Focus is on principles of learning that have the greatest utility for professional educators. This course provides a foundation for more advanced courses in human learning. Prerequisite: A301.

A320—Foundations of Counseling and School Psychology (3). Introduction to major approaches to helping relationships with children, adolescents and adults in various professional settings. Professional organizations and ethical standards. Prerequisite: Psychology 1 or 2.

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 and 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.

A350—Readings (1-3). Prerequisite: instructor's consent.

A351—Foundations of Group Procedures (3). Introduction to group procedures as applied to counseling, student affairs, school, family and other work settings. Participation in a group is required. Prerequisite: Psychology 1 or 2.

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. Prerequisite: Psychology 1 or 2.

A362—Work Adjustment Procedures for the Handicapped (3). Methods of improving personal/social adjustment, work conditioning and pre-vocational skills of people with mental and physical disabilities. Covers basic counseling techniques and writing work adjustment plans. Prerequisite: A361.

A363—Vocational Placement of Persons with Disabilities (3). Techniques of job development, placement, job analysis, transferable skill analysis and employer development. Prerequisite: A361.

A365—Alcohol Abuse and Rehabilitation I (3). Covers historical perspective, definition and measurement of the problem, classifications and theories about the etiology of alchoholism. Prerequisite: A320 or A361 or instructor's consent.

A366—Alcohol Abuse and Rehabilitation II (3). Designed for students considering a career in the treatment of alcoholism. Focus on assessment of alcohol problems, medical

aspects of alcohol abuse and treatment modalities. Prerequisite: A365.

A370—Senior Field Experience (3-8). Field experience for undergraduates in approved agencies, businesses or institutions. Students work 30 hours for each credit hour. S/U graded only. Prerequisites: A160, A320, senior standing and departmental consent.

A371—Foundations of Career Development (3). Introduces major theoretical orientations to career development, characteristics, requirements of occupations and training opportunities, nature and use of career resources and career counseling techniques. Prerequisite: Psychology 1 or 2.

A372—Career Resources in Business and Industry (2-4). Personnel practices, occupational requirements, career opportunities and resources in business and industry. Applications are emphasized through on-site visits and use of business-industry-labor personnel. Prerequisite: A371 or instructor's consent. S/U graded only.

A373—Theory and Practice in Career Development (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: A371.

A380—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 and beginning course in statistics.

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.

A382—Vocational Assessment of the Handicapped (3). Assessment of vocational interests, needs aptitudes and abilities of people with mentally and physically disabled. Work samples, commercial systems, job analysis, job matching systems and measures of work personality. Lab experience. Prerequisites: A361 and A380.

A400—Problems (1-3). Prerequisite instructor's consent.

A406—Mental Health Principles and Programs (3). Psychology of mental health. Emphasizes normal personality and development of positive mental health in school environment. Examines current and emerging mental health programs and services. Prerequisite: A301 or A320.

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 adolescent problems are emphasized. Prerequisite: A301.

A410—Seminar (1-3). Prerequisite: instructor's consent.

A411—Adviser's Seminar (1). Prerequisite: departmental consent.

A417—Advanced Human Learning (3). A study of behavioral and cognitive theories of learning, with an emphasis on those with 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. Prerequisite: A417 or instructor's consent.

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.

A423—Family Counseling (3). Appropriate for students who will work with families in a professional setting. Examines family systems theories and major theories in terms of family needs. Skill development in family counseling processes. Prerequisite: A420.

A424—Marriage Counseling (3). Process of marriage counseling, premarital and divorce counseling, sexual adjustment in marriage, marital enrichment and research in marriage counseling. Prerequisite: A420.

A425—Counseling Psychology Practicum (3-6). Supervised practice of counseling in an approved counseling setting. Prerequisites: A371, A420, A480 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, 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. Prerequisite: 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 consent of instructor.

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. Prerequisite: 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. Prerequisite: A320 or instructor's consent.

A436—Multicultural Issues in Counseling (3). A study of the effects of personal and institutional racism, ageism, sexism, attitudes about sexual preference and disabilities on the counseling process by exploring the literature, and experiencing interactions designed to clarify personal values. Prerequisite: A425 or A426.

A440—Foundations of Student Development (3) (same as Higher and Adult Education K462). History, philosophy theory and issues pertinent to student affairs work. Prerequisite: 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. Prerequisite: A440 or Higher and Adult Education K462.

A442—Practicum in Student Development Programs (3). Supervised practice in student personnel services in an approved agency. Prerequisite: A440 or Higher and Adult Education K462. S/U graded only.

A450—Research (3-6). Supervised research for master's and specialist degree. Prerequisite: departmental consent.

Educational Administration Educational and Counseling Psychology

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 only. Prerequisites: A451 and instructor's consent.

A453—Practicum and Theory in Group Counseling II (4). A continuation of A452. S/U graded only. Prerequisites: A452 and instructor's consent.

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 people with mental and physical disabilities. Prerequisite: A361

A462—Medical 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—Psychological Aspects of Disability (2). Introduces rehabilitation counselors and service workers to unique psychological problems and adjustments associated with physical and mental disabilities. Intervention strategies to facilitate vocational, social and personal adjustment. Prerequisite: A361.

A470—Field Experience in Counseling (3-9). Prerequisite: instructor's consent. S/U graded only.

A471—Analysis of Research in Career Development (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: A371.

A472—Practicum in Career Development and Career Counseling (3-6). Supervised practice in career development and career counseling in an approved setting. S/U graded only. Prerequisites: A425 or A426 and A471.

A480—Measurement of Interest and Personality (3). Interprets educational interest, personality test data and data in personnel records emphasizing the use of data in counseling. Prerequisite: A380.

A481—Individual Intelligence Testing (3). Study of Stanford-Binet Scale and Wechsler's Intelligence Test. Practice in administering and interpreting tests. Prerequisite: A380.

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. Prerequisite: 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. Prerequisite: A480 or A481.

A490—Research (1-12). Independent research leading to

dissertation. Prerequisite: departmental consent.

A491—Internship in Counseling Psychology (3-6). 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 (3-6). Supervised practice in school psychology in an institutional or applied setting. Prerequisite: departmental consent. May be repeated. S/U graded only.

Electrical and Computer Engineering

College of Engineering
203 Electrical Engineering Building
(314)882-7559

FACULTY

Jon Meese, chairman, professor, PhD, Purdue University
Robert W. Leavene, director of graduate studies, associate professor, PhD, University of Missouri-Columbia
Gayle E. Adams, professor emeritus, PhD, University of Wisconsin
Robert L. Carter, professor emeritus, PhD, Duke University
Robert G. Combs, professor, PhD, University of Florida
Earl J. Charlson, professor, PhD, Carnegie-Mellon University
Dean Franklin, professor, director of Dalton Research Center, PhD
Cyrus O. Harbourt, professor, PhD, University of Syracuse
Richard G. Hoft, professor, PhD, Iowa State University
William D. McFarland, professor, PhD, University of Missouri-Columbia
Robert W. McLaren, professor, PhD, Purdue University
Gladwyn V. Lago, professor emeritus, PhD, Purdue University
Russell Pimmel, professor, PhD, Iowa State University
Byron W. Sherman, professor, PhD, University of Missouri-Columbia
Charles Slivinsky, professor, PhD, University of Arizona
James R. Tudor, professor emeritus, PhD, Illinois Institute of Technology
Harry W. Tyrer, professor, PhD, Duke University
Kenneth Unklesbay, professor, PhD, University of Missouri-Columbia
Rex A. Waid, professor, PhD, University of Wisconsin
Donald L. Waidelich, professor emeritus, PhD, Iowa State University
Elaine Charlson, associate professor, PhD, University of Missouri-Columbia
Michael J. Devaney, associate professor, PhD, University of Missouri-Columbia
Huber L. Graham, associate professor, PhD, Massachusetts Institute of Technology
James Keller, associate professor, PhD, University of Missouri-Columbia
Jerome Knopp, associate professor, PhD, University of Texas
Chun-Shin Lin, associate professor, PhD, Purdue University
Robert O'Connell, associate professor, PhD, University of Illinois
Edward J. Vredenburgh, associate professor emeritus, MS, University of Missouri-Columbia
Xinhua Zhuang, associate professor, PhD, Peking University
Ghulam M. Chandry, assistant professor, PhD, Wayne State University
Suat Ertem, assistant professor, PhD, University of Missouri-Columbia
Raghu Krishnapuram, assistant professor, PhD, Carnegie-Mellon University
Mohammad Obaidat, assistant professor, PhD, The Ohio State University
David G. Skitek, assistant professor, PhD, University of Arizona
Tina E. Stacy, assistant professor, PhD, University of Missouri-Columbia

DEGREES: MS and PhD in electrical engineering

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. Areas of study include artificial intelligence, automatic control, energy systems and resources, bioengineering, VLSI fabrication, optoelectronics, semiconductor devices, information systems, integrated circuits and systems, digital computer systems, power electronic and image analysis.

Excellent computer equipment and other laboratory facilities, all within the Electrical Engineering Building, are used for applied research sponsored by various government and industry sources of research funding. Especially well-known are the department's research programs in power electronics, solid-state devices, computer vision and neural networks.

Fellowships, scholarships and teaching and research assistantships are available to qualified students. Applications should be submitted by March 1 each year.

Additional information, including applications for financial support, can be obtained from the Director of Graduate Studies, Department of Electrical Engineering, 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) on 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. A student with a GPA less than 3.0 must submit a written petition to the director of graduate studies requesting special consideration for acceptance. The petition must explain the reasons that special consideration is believed to be justified, and must be accompanied by two letters of recommendation from people familiar with the applicant's recent engineering or academic work. Consideration is given to the petition, recommendations, grade trends and probability of success in graduate study. Preferably, the student should have a BS in electrical engineering or other science-based curriculum. A student also should have taken the verbal and quantitative sections of the GRE.

To fulfill the requirements for the MS degree, a candidate must complete 30 hours, including at least 15 hours of 400-level courses. 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 six hours of graduate credit may be used from a previous master's degree completed at the university or elsewhere. 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 is required. At least three hours of research or problems is required. The student's overall GPA must be at least 3.0. The master's degree must be completed within eight years after the initial enrollment. Each candidate must pass a final examination to demonstrate mastery of the work included in the thesis or in a substantial independent project.

DOCTORAL DEGREE: A student may be accepted for advisement in the department's doctoral program by showing superior performance on the verbal and quantitative parts of the GRE and by having a 3.5 or higher GPA in all previous graduate course work. Consideration is given to grade trends, experience, maturity and other criteria bearing on the student's probable success in the program.

To be accepted as a candidate, the student must complete the equivalent of an MS in electrical engineering and demonstrate competency by a written or oral qualifying examination conducted by a PhD qualifying committee. Acceptance also requires approval by the electrical engineering faculty.

The doctoral program committee sets the total hours; 72 semester hours beyond the BS are required. Research on the doctoral dissertation generally takes about one full year.

The candidate must pass a written and oral comprehensive examination in electrical engineering, complete a doctoral dissertation on a topic approved by the committee and defend the dissertation in an oral final examination.

COURSES

205—Circuit Theory II (3). Continuous and discrete systems analysis; discrete and continuous convolution techniques, state variable techniques. Prerequisites: 20, 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. Prerequisite: 216.

216—Linear Systems and Circuits (3). Transform techniques in linear systems z-transform; Fourier series and transform; Laplace transform. Prerequisite: 205.

220—Instrumentation for Life Scientists (4). Not for engineering students. Properties of signals and their modification by transduction, transmission, recording. Basic instrumentation schemes serve as examples, with heavy emphasis on electronic circuits and their operation.

225—Electromagnetic Fields (3). Elements of vector analysis, electrostatics, magnetostatics, time-varying fields and plane waves. Prerequisites: Physics 176 and Mathematics 304 concurrently.

226—Logic Design (4). Digital electronics, chip level logic design, algorithmic state machines, microprocessor architecture and interfacing and digital system design methodology. Includes one-hour laboratory. Prerequisite: 126. Co-requisite: 255.

227—Algorithms and Software Design (3). This course covers basic algorithms including arithmetic operations, sorting, string processing, parsing, hashing, and tree and graph manipulations. A high-level language (like ADA or C) and programming environment is used as a vehicle for illustration and practice in use of the algorithms and in the application of software design techniques. Prerequisite: 126.

235—Physical Electronics (3). Structure of crystals. Quantum aspects of radiation and matter. Energy and theory, electronic and optical properties of semiconductors, p-n junction physics and semiconductor diodes. Bipolar and field-effect transistor physics. Prerequisites: Physics 176 and Mathematics 304.

255—Experimental Electrical Engineering I (3). Application of standard electronic test equipment to basic experimental tasks of measurement and characterization of elec-

tronic phenomena and devices. Prerequisite: 205 concurrently.

256—Experimental Electrical Engineering II (3). Continuation of 255, emphasizing experimental techniques in analysis, design and practical optimization. Topics selected from circuits, electromagnetics, electromechanical systems and digital circuits. Prerequisite: 255. Co-requisite: 286.

266—Power Engineering I (3). Magnetic circuits in general and in machinery; DC machine theory, operation, applications; transformer circuits, synchronous machine theory, applications; basic principles of energy conversion; use of matrices; basic principles of power transmission and control. Prerequisite: 205.

286—Electronic Circuits & Signals I (3). Electron devices, modeling and applications to basic electronic circuits, including RC amplifiers and power supplies. Lecture and lab. Prerequisites: 205 and 255.

300—Problems (2-4). Analytical or experimental problems pertaining to electric circuits, machines, fields or electronics. Prerequisites: 12 hours of electrical and 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 and Nuclear Engineering 304).

306—Systems Software Engineering (4). Concepts of operating systems are described in a language independent manner. Each major topic is implemented as a module from which a student develops an operating system. Examples drawn from PC-DOS, UNIX and VAX/VMS. Prerequisite: 227.

307—Introduction to Digital Signal Processing (4). Concepts, analytical tools, design techniques used in computer processing of signals; includes signal representation, sampling, discrete time systems analysis, recursive/non-recursive filters, design and implementation, (discrete Fourier transform/two-dimensional filtering). Prerequisites: 216, 256 and 126.

309—Robotic Control And Intelligence (4). Introduces robotics; robot system characteristics; robot motive power systems; geometric structure of robots; sensors and feedback; control applications and algorithms; data acquisition and output actuation functions; robots and AI; unprocessor applications. Lecture and laboratory. Prerequisites: 206, 226, and 256 or 326

310—Introduction to Bioengineering (3) (same as Mechanical and Aerospace Engineering 310). Detailed look at selected biological systems and problems; emphasis on engineering aspects such as measurement, analysis synthesis and modeling. Prerequisite: 256 or Mechanical and Aerospace Engineering 252.

315—Energy Systems and Resources (3) (same as Mechanical and Aerospace Engineering 315 and Nuclear Engineering 315). Analysis of present energy usage in Missouri, the United States and the world, evaluation of emerging energy technologies and trends for the future. Economics and environmental impact of the developed technologies. Prerequisite: 99 or equivalent.

318—Network Synthesis and Filter Design (4). Fundamentals with emphasis on design of filters; positive real functions, physical realizability conditions, the approximation problem RLC and RC passive filters and RC active filters. Prerequisites: 216 and 256.

326—Microcomputer Architecture and Interfacing (4). Advanced microprocessor architecture and programming; special interface devices, such as memory controllers, disk controller, 1/0 processors, terminal controllers, communication interfaces and co-processors. Prerequisite: 226.

327—Computer Architecture (3). Architectural features of high-performance computer systems including hierarchical and virtual memory, pipelining, vector processing, SIMD processors, interconnection networks, multiprocessor organization and concurrent programming. Prerequisite: 306 or 326.

328—Design of Digital Subsystems (3). Covers methodology and techniques of logical design of structures discussed in 327. Companion course to 327. Prerequisite: 226.

330—Electronic Circuits and Signals II (4). Study of operating point stability, feedback amplifiers, oscillators, modulation and detection, typical IC circuits for both digital and analog signals and power supplies. Prerequisites: 256 and 286.

332—Introduction to Optical Electronics (3). Principles, devices and materials used to produce, modulate and detect optical radiation. Review of pertinent properties of light and semiconductors. Display devices and lasers. Electro-optic, Faraday and acousto-optic effects and modulation schemes. Thermal, photoemissive, photoconductive and junction detectors. Application to fiber-optical communication.

333—Semiconductor Device Theory (3). Semiconductor devices and their terminal characteristics. Theories of p-n junctions, junction transistors and field-effect transistors. Surveys modern semiconductor devices. Prerequisite: 235.

334—Design and Analysis of Integrated Circuits (3). Principles and technology of monolithic integrated circuits. Design, layout and implementation of digital and linear circuits. Surveys of current circuits and their application. Prerequisites: 235 and 286.

335—Solid State Area Laboratory (1). Laboratory experiments involved with solid state theory as an introduction to its application in discrete devices and integrated circuits. Prerequisite: concurrent with 333 or 334.

336—Power Electronics I (4). Power electronic device characteristics, important circuit and component concepts, phase controlled rectifiers, line commutated inverters and ac phase control. Includes laboratory projects. Prerequisites: 256 and 286.

345—Electromechanical Conversion I (4). Theory and practice of electrical machinery. Lecture and laboratory. Prerequisites: 256 and 266.

346—Introduction to Nuclear Reactor Engineering (3) (same as Mechanical and 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.

354—Microprogramming (3). Reviews classical computer architecture and control units. Modern microprogram controlled computer architecture, advantages/disadvantages, architectural implications of writable control stores. Microprogramming examples (IBM 360, Interdata 70 and 85, National IMP-16). Emulation, microdiagnostics. Prerequisites: 226 and 227.

356—Control Systems Area Laboratory (1). Experiments in basic linear feedback and computer process control. To complement either 358 or 359. May be taken only once. Concurrent with 358 or 359. Prerequisite: 256 or 326.

357—Experimental Electrical Engineering III (3). Realistic engineering task assignments of four-week or longer duration requiring experimentation in their solutions. Written and oral communication of plans, progress and results. Prerequisite: 256.

358—Automatic Control System Design (3). Techniques for feedback system design and analysis computational aids, compensation design and example, state variable methods, non-linear systems and sampled data control systems. Lecture and laboratory. Prerequisites: 126 and 206.

359—Computer Process Control (3). Introduces process control; role of analog and digital computers in the control of automatic processing systems; digital control systems analysis and design algorithms; process control applications. Prerequisites: 206 and 226.

361—Introduction to Power Systems (4). Introduces concepts of equipment, regulation, trade terms and engineering economics applications to power systems. Prerequisites: 256 and 266.

362—Power Systems Analysis (3). Transmission line equations including resistance, conductance and capacitance. Introduces per unit system and voltage regulation. Prerequisite: 266.

Electrical and Computer Engineering

364—Computer Applications to Power Systems (3). Load flow, fault, network reduction and transient stability studies on digital and analog computers. Prerequisite: 361 or 362.

365—Introduction to Digital Image Processing (3). Fundamentals of digital image processing hardware and software, including digital image acquisition, image display, image enhancement and compression. Prerequisites: senior standing, experience in high-level language.

366—Introduction to Pattern Recognition (3). Aspects of pattern recognition theory; computer application to design and training of pattern recognizers using examples from speech recognition, visual inspection, clinical medicine, automatic photographic recognition and advanced automation. Prerequisite: senior standing.

368—Electric Power Distribution Systems (3). Operation and design of utility and industrial distribution systems including distribution system planning; load characteristics; application of distribution transformers; design of subtransmission lines, distribution substations, primary systems, secondary systems; application of capacitors; voltage regulation and reliability. Prerequisite: 266.

372—Modulation and Transmission of Signals (3). Review of Fourier analysis of signals, study of signal transmission. Analog modulation and demodulation, use of non-linear devices in modulation systems, sampling and pulse modulation. Prerequisites: 216 and 286.

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: 225 and 256.

378—Microwave Principles (4). Maxwell's equations, transmission lines, plane wave propagation and reflection, wave guides, resonators, microwave devices, antenna and radio wave propagation. Lecture and laboratory. Prerequisites: 225 and 256.

382—Lasers and Their Applications (3) (same as Mechanical and Aerospace Engineering 382 and Nuclear Engineering 382).

388—Design and Simulation of VLSI Circuits (4). Design of NMOS and CMOS integrated circuits with emphasis on digital applications. Device models are developed for circuit simulation. Lecture and laboratory. Prerequisite: 334 or instructor's consent.

400—Problems (2-5). Supervised investigation in electrical engineering to be presented in form of report.

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 investers and cycloconverters. Prerequisite: 336.

406—Parallel and Distributed Processing (3). Covers the fundamental issues involved in designing and writing programs for simultaneous execution. Semaphores and monitor constructs are covered to provide a basis for critical section programming. Expansion of these concepts provide a basis for the analysis and design of control systems for multiprocessor devices and computer networks. Prerequisite: 227 or suitable system programming course, or instructor's consent.

407—Advanced Digital Signal Processing (3). Topics in digital signal analysis and filtering, including hardware implementation, speech synthesis and recognition, multidimensional 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 and Nuclear Engineering 408).

410—Seminar (1). Reviews of recent investigations and

projects of major importance. Prerequisite: graduate standing.

411—Advanced Electrical Machinery Theory (3). Electrical machinery fundamentals necessary for understanding advanced literature. Applications of symmetrical components to machinery analysis. Prerequisite: 347 or equivalent.

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. Prerequisite: 402 or instructor's consent. Recommended: 408 and 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. Prerequisite: 372 or instructor's consent.

426—Functional Languages and Architectures (3). Describes functional languages (such as LISP and FP) and the architecture to execute these languages, including LISP machines and data-flow computers.

428—Digital Hardware Systems Design (3). Characteristics and parameters of various hardware subsystems, including main memory, auxiliary memory, arithmetic units, card equipment and principles of organization into efficient system. Prerequisite: 328.

430—Power-Systems Stability (3). Performance of synchronous machines under transient conditions; power system stability; system fault computations using symmetrical components; computer solutions of power system problems.

431—Economics of Power Systems (3). Transmission loss formula coefficients, incremental costs and losses, and economic scheduling of generation and applications. Prerequisite: 364.

433—Extra High Voltage Power Systems (3). Design and performance criteria for extra high voltage, including insulation, apparatus, line and related system equipment. Prerequisite: 362 or equivalent.

436—Lightning and Switching Surges in Power Systems (3). Over voltage, switching surge and lightning effects on a power system. Use of grounding and lightning arresters. Effects of surges of and on machines. Prerequisite: 362.

442—Advanced Integrated Circuits (3). Fundamentals of advanced integrated circuit design, diffusion, ion implantation 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 and application of X-ray analysis to the study of crystallinity. Quantum mechanical solution for the wave function of an electron in a solid and concepts of reciprocal space. Prerequisite: 443 or Physics 415.

450—Superconductivity and its Applications (3). (same as Nuclear Engineering and Mechanical and Aerospace Engineering 450) Phenomenology and theory of superconductivity; cryogenic practice; metallurgy of superconducting elements; alloys and compounds. Applications, present and prospective.

456—Interactive Computer Graphics (3). Survey of interactive graphics techniques and methodologies. Emphasizes computer graphics software. Prerequisites 227, Mathematics 331 or instructor's consent.

458—Introduction to the 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.

467—Optimal Control Theory (3). Analysis and design of dynamic systems, using optimal control theory parameter optimization, dynamic optimization, computational methods and differential games. Prerequisite: 408.

468—Stochastic Optimal Estimation and Control (3). Surveys random process theory; stochastic control and optimization; estimation and filtering based on Kalman-Bucy techniques; stochastic stability; adaptive and learning control systems. Prerequisites: 408 and Statistics 325.

469—Digital and Sample-Data Systems (3). Introduces sampling and quantization, design of digital and sample-data systems, digital filters, adaptive sampling and quantization. Prerequisites: 307, Mathematics 310 or instructor's consent.

470—Applications of Transforms (3). Application of Laplace and other tranform methods of solution of circuit and field problems.

471—Neural Network Based Computing Systems (3). The course will consider computing systems based on neural networks and learning models, along with implementations and applications of such systems. Prerequisite: 366 or instructor's consent.

472—Communication Theory I (3). Generalized communication systems, signal processing, signals as random processes and optimum receivers. Prerequisites: 372 and Statistics 320.

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.

475—Information Theory (3). Shannon-McMillan theorem, its generalizations and coding-decoding methods proposed to satisfy this theorem. Prerequisite: instructor's consent.

476—Theory of Automata (3). Sequential machines, Turing machines, deterministic and stochastic automata, and applications of automata. Prerequisite: instructor's consent.

479—Computer Vision (3). Image processing methods for segmentation, object representation, scene description and scene interpretation. Prerequisite: 365 or instructor's consent.

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 (cr. arr.). Independent investigation in field of electrical engineering, to be presented as thesis or dissertation.

English

College of Arts and Science
107 Tate Hall (314)882-6421

FACULTY

Ellie Ragland-Sullivan, chairwoman, professor, PhD, University of Michigan

Martin Camargo, director of graduate studies, associate professor, PhD, University of Illinois

Donald Anderson, professor, PhD, Duke University

Robert M. Bender, professor, PhD, University of Michigan

Thomas D. Cooke, professor, PhD, University of Pittsburgh

J. Donald Crowley, professor, PhD, The Ohio State University

W. C. Daniel, professor emeritus, PhD, Bowling Green State University

Albert J. Devlin, professor, PhD, University of Kansas

Leon T. Dickinson, professor emeritus, PhD, University of Chicago

John M. Foley, professor, PhD, University of Massachusetts

Howard W. Fulweiler, professor, PhD, University of North Carolina

Charles H. Hinnant, professor, PhD, Columbia University

Richard A. Hocks, professor, PhD, University of North Carolina

James V. Holleran, professor, PhD, Louisiana State University

William V. Holtz, professor, PhD, University of Michigan

Winifred B. Horner, professor emeritus, PhD, University of Michigan

William M. Jones, professor emeritus, PhD, Northwestern University

Mary M. Lago, professor emeritus, PhD, University of Missouri-Columbia

Donald M. Lance, professor, PhD, University of Texas

Timothy Materer, professor, PhD, Stanford University

Speer Morgan, professor, PhD, Stanford University

Catherine Parke, professor, PhD, Stanford University

William M. Peden, professor emeritus, PhD, University of Virginia

M. Gilbert Porter, professor, PhD, University of Oregon

Thomas V. Quirk, professor, PhD, University of New Mexico

John R. Roberts, professor, PhD, University of Illinois

Howard H. Hinkel, associate professor, PhD, Tulane University

Clenora Hudson-Weems, associate professor, PhD, University of Iowa

Douglas G. Hunt, associate professor, BA, Oxford University

Elaine J. Lawless, associate professor, PhD, Indiana University

Lynne McMahon, associate professor, PhD, University of Utah

Sherod Santos, associate professor, PhD, University of Utah

Gladys Swan, associate professor, MA, Claremont Graduate School

C. Gilbert Youmans, associate professor, PhD, University of Wisconsin

Prahlad Folly, assistant professor, PhD, University of California-Los Angeles

Geta LeSeur, assistant professor, PhD, Indiana University

Patricia Okker, assistant professor, PhD, University of Illinois

Krista Ratcliffe, assistant professor, PhD, The Ohio State University

Charles Shepherdson, assistant professor, PhD, Vanderbilt University

DEGREES: MA and PhD in English

Lecture courses, seminars and directed research are available in all historical periods of British and American literature and linguistics, in creative writing, in rhetoric and composition and in criticism and literary theory.

Normally, the master's degree is completed in one calendar year and the PhD in four or five years of full-time study beyond the baccalaureate degree.

Low grades or a pattern of incomplete and delayed work causes a candidacy to be terminated. The lowest passing grade for graduate work is B. Consistent B or near B work is not interpreted as satisfactory evidence of PhD ability, and the student with such a record is not encouraged to pursue work beyond the MA level. No grade of C is counted for credit toward the MA or the PhD degree. If a candidate for either degree receives three grades of C or F from at least two different instructors, the department will not continue the candidacy.

MASTER'S DEGREE: An MA candidate should have a baccalaureate degree in English with a minimum of 24 hours, including at least 18 hours in the fields of advanced writing, linguistics and medieval, Renaissance, 17th-century, 18th-century, 19th-century, 20th-century and American literature, and at least eight hours in

such related fields as classics, European history, philosophy and art history and a GPA of at least 3.0 (A=4.0) on the last half of the undergraduate course of study, with a better than 3.0 average in English courses. Applicants must submit transcripts of all undergraduate work, at least three letters of recommendation and results of the GRE.

A student whose undergraduate major is not in English, or is in English but not comparable to the degree offered by MU, may be required to take more than the normal course load for the MA, as determined by the admissions committee.

A student seeking an MA in English elects one of four concentrations: literature, creative writing, language, or composition and rhetoric. ***For the specific requirements of each program, write the Director of Graduate Studies, Department of English, Columbia, Mo. 65211.***

Each MA final examination is graded by a committee appointed by the director of graduate studies. The final examination may be taken in the semester when the candidate is completing or has completed 30 hours of course work. There are three possible grades for each exam: doctoral pass, pass and fail. A student receiving two or more failing votes fails the exam. Any candidate who fails may take the comprehensives a second time. A student receiving fewer than two grades of doctoral pass would normally not be allowed to enter the PhD program.

DOCTORAL DEGREE: A PhD candidate must hold an MA degree in English or have completed at least 30 hours of graduate work in the field. Transcripts for all college work, three letters of recommendation, results of the GRE (general test; subject test in literature is optional) and a substantial sample of written work (such as term papers) must be submitted for admission. 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 more permanent adviser is assigned.

A doctoral program committee, appointed by the director of graduate studies, must certify the student and approve the course of study. In addition, the student is required to meet with the program committee for a qualifying examination during the first year of PhD course work.

A student remains a candidate in good standing so long as work reflects good progress toward the degree. The PhD candidate must take approximately 30 hours of graduate work beyond the MA, more than half of which must be at the 400 level. Credit granted for Research 490 is excluded from this total. A maximum of three hours can be granted for Problems 400 only after written permission is obtained from the graduate studies committee.

Excluding research hours, a minimum of 24 hours of course work beyond the MA must be completed in residence at MU, must be in English and is usually the last hours taken.

A student may satisfy the foreign language requirement for the PhD in English in one of two ways:

- by demonstrating a knowledge of one foreign language and its literature at the fourth-year college level. If this option is chosen, the student must satisfy the requirement by passing with a grade of B or better two upperclass courses in the literature of the language chosen. These courses may not be in translation, they must be either at the 200 level or above at MU, or the equivalent elsewhere. If taken elsewhere, they must have been completed within five years of the candidate's enrollment in the PhD program. French, German or Latin will be automatically accepted as fulfilling this requirement. Another language may be substituted with the consent of the student's program committee.
- A student may satisfy the foreign language requirement for the PhD in English by passing ETS examinations in two foreign languages with a minimum score of 510 for French, 470 for Spanish, or 480 for German. All language requirements must be satisfactorily completed before the candidate is eligible to take the comprehensive examination.

The comprehensive examination, both written and oral, covers the student's special field and a related field.

The doctoral dissertation is written under the direction of the candidate's adviser, a qualified member of the English faculty at MU. The dissertation and the final oral examination on the dissertation and its field complete the requirements for the PhD in English.

COURSES

201—The Tradition of English Literature Beginnings to 1784 (3). Historical survey from beginnings of English literature through the age of Johnson, with readings representing significant writers, works and currents of thought. Strongly recommended for English majors. Prerequisite: sophomore standing.

202—The Tradition of English Literature Romanticism to the Present (3). Historical survey of English literature from the Romantic period to the present, emphasizing important writers and significant intellectual and cultural movements. Strongly recommended for English majors. Prerequisite: sophomore standing.

206—Special Themes in Literature (3-6). Topics announced at time of registration. Prerequisite: junior standing. May repeat to six hours maximum.

208—Historical 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.

250—Independent Research in English (13). Development of a carefully considered independent research project under close supervision of a faculty member. Open to undergraduate students only. Prerequisites: 20 and sophomore standing or equivalent, departmental consent.

260—Advanced Writing (3). An advanced writing course for students who want practice in expository writing. Emphasis will be on the writing process and rhetorical concerns of topic, voice and audience. Prerequisite: 20 or equivalent.

275—Survey of American Literature, 1607-1890 (3). An intensive survey of major writers and movements in American literature from 1607 to 1890. Prerequisites: sophomore standing and 20 or equivalent.

276—Survey of American Literature, 1890-Present (3). An intensive survey of major writers and movements in American literature from 1890 to the present. Prerequisites: sophomore standing and 20 or equivalent.

285—American Folklore (3). Course will focus on regional and ethnic American folklore. Folk groups studied will include American Indians, black Americans, Mexican-Americans and religious Americans. Requirements include a fieldwork project, three exams and book reports.

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 (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

302—The Writing of Fiction (3). Advanced fiction writing with group discussion, individual conference.

303—The Writing of Fiction (3). Advanced fiction writing with group discussion, individual conference.

304—Afro-American Literature (3). Surveys literature written by black-American authors beginning with the Harlem renaissance and continuing to the present. Major genres.

306—Theory and Practice of College Composition (3). Current and historical theories of rhetoric and composition as applied to the teaching of college composition. Prerequisite: instructor's consent.

307—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.

308—Major Women Writers (3) (same as Women Studies 308). A study of from two to five significant writers to be read intensively using contemporary feminist critical theory. Prerequisites: two courses in English or American Literature at the 300 level.

309—Topics in Linguistics (3-6) (same as Linguistics 309). Topics announced at time of registration. May be repeated to six hours maximum.

310—The English Bible (3). Studies the Old and New Testaments in the King James version, from a historical and literary perspective, to help students understand the influence of biblical genres, history and materials on English literature.

311—Beginning Playwriting (3) (same as Theatre 311).

312—Advanced Playwriting (3) (same as Theatre 312).

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: 70 or instructor's consent.

314—The Writing of Poetry (3). Poetry regarded as a mode of understanding. Poetic values related to other values. Practical consideration of verse techniques. Prerequisite: 70 or instructor's consent.

318—Introduction to Old English (3) (same as Linguistics 418 and Germanic and Slavic Studies 418). Beginning study of Anglo-Saxon.

319—The Structure of American English (3) (same as Linguistics 319). For prospective teachers. Required of MA candidates in English and English majors in education. Study of current English sounds, grammar and usage.

320—History of the English Language (3) (same as Linguistics 320). Development of English from its beginnings to modern times.

322—Regional and Social Dialects of American English (3) (same as Linguistics 322). Pronunciation, vocabulary and grammar of English as used by different social and age groups in the various regions of the United States. Prerequisite 319 or equivalent.

323—Principles of Teaching English as a Second Language (3) (same as Linguistics 323). Linguistic and pedagogical principles of language teaching, study of phonology and grammar of English and contrastive linguistic analysis. Prerequisite 319 or equivalent.

325—Chaucer (3). Canterbury Tales and other works, social background of Chaucer's England and introduction to Middle English.

326—Medieval English Literature (3). Representative works largely in translation, from the Anglo-Saxon and Middle-English periods.

331—Elizabethan Poetry and Prose (3). Surveys non-dramatic literature of the 16th century, including Ascham, Elyot, Wyatt, Surrey, Sidney, Spenser, Daniel and Drayton.

333—Elizabethan Drama (3). Surveys English drama from 1580 to 1642, with emphasis on Marlowe and Jonson.

335—Shakespeare Survey (3). A survey of 10 to 14 representative plays by Shakespeare, including comedies, histories, tragedies and romances. No credit if English 135 or 136 is taken. Prerequisites: 20 and sophomore standing.

336—Themes in Shakespeare (3-6). Study of selected plays and poems. Themes covered will vary from term to term. Graduate students may repeat for up to six hours credit with different themes. Prerequisites: 20 and sophomore standing.

345—Milton (3). Milton's life and works.

350—Special Readings (cr. arr.). 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.

351—Early Seventeenth-Century Poetry and Prose (3). Survey of poetry and prose from 1600 to 1660.

352—The Metaphysical Poets (3). Intensive study of major 17th-century metaphysical poets Donne, Herbert, Vaughan, Crashaw and Marvell.

355—Literature of the Restoration and Early Eighteenth Century (3). English literature from 1660 to 1740; Rochester, Bunyan and Dryden; the court wits and dramatists of the restoration Defoe, Swift, Pope and Gay.

356—The Later Eighteenth Century (3). English literature from 1740 to 1790, with major emphasis on the works of Johnson and his circle.

357—The Eighteenth-Century English Novel Defoe, Richardson, Fielding (3). Representative novels and novelists to 1800.

365—The Romantic Poets (3). Representative authors and major literary tendencies.

367—The Age of Victoria Prose, Poetry and Drama (3). Survey of Victorian literature from 1830 to 1900, with representative readings in poetry, drama, non-fictional and fictional prose. Included are Tennyson, Browning, Dickens, Carlyle, Arnold, Mill and Wilde.

368—The Nineteenth-Century English Novel (3). Representative novels and novelists, 1800 to 1900.

373—Colonial American Literature (3). Survey of American literature to 1800, with emphasis on narratives of discovery and exploration, and on seminal works of social, religious and political thought.

375—American Romanticism (3). American literature of early 19th century with emphasis on major figures Emerson, Thoreau, Hawthorne, Melville, Poe and Whitman.

377—The Nineteenth-Century American Novel (3). Intensive study of six or seven major 19th-century American novelists. For majors in English and English education and for eligible graduate students.

378—The Rise of Realism (3). American literature from Civil War to 1900, with emphasis on major figures Mark Twain, Howells, James, Emily Dickinson and Crane.

385—Special Themes in Folklore (3). Intensive study in a selected area of folklore: folk narrative, folk song, myth and literature. May be repeated for a maximum of six hours. Prerequisite instructor's consent for repetition.

387—Oral Tradition (3). Study of selected works of world literature with roots in oral tradition. Texts will vary, but will always include the Bible, the Iliad and Odyssey and Beowulf. Prerequisites junior or senior standing or instructor's consent.

389—Modern Literature (3). A study of selected 20th-century British and American authors within the intellectual and cultural contexts of the modern era.

391—Chief Modern Novelists Prior to 1940 (3). Study of representative American and British novelists.

392—Chief Modern Poets Prior to 1940 (3). Study of representative 20th-century poets in England and America.

393—Modern Short Story 1900 to Present (3). Directions and tendencies in 20th-century short fiction.

394—Chief Contemporary Novelists (3). Study of representative post-World War II American and British novelists.

395—Chief Contemporary Poets (3). Directions and tendencies in recent poetry.

396—Modern Drama (3). Survey of European and American drama from Ibsen to the present.

400—Problems (cr. arr.). Individual work not leading to preparation of dissertation. Prerequisite: departmental approval.

401—Bibliography and Methods of Research (3). Principles and aims of literary scholarship and criticism and systematic study of bibliographic resources for research. Normally restricted to doctoral candidates.

402—Advanced Writing of Fiction (3). Advanced fiction writing designed primarily for graduate students, with the intention of producing work of professional quality. Prerequisites: instructor's consent, 302 and 303, except by special consent.

403—Advanced Writing of Fiction (3). Advanced fiction writing designed primarily for graduate students, with the intention of producing work of professional quality. Prerequisites: instructor's consent, 302 and 303, except by special consent.

405—Internship in Publishing (3). Students enrolled in one of two programs: assistant editors for Missouri Review or interns at UM Press. One year involvement, three hours, credit a semester, second semester applicable to English degree requirements. Prerequisite: instructor's consent.

407—Studies in Rhetorical Theory (3). Studies in rhetorical theory of selected historical periods. May be repeated to a maximum of nine hours.

413—Advanced Writing of Poetry (3). Advanced poetry writing designed for graduate students, with the intention of producing work of professional quality. Prerequisites: instructor's consent, 313 and 314, except by special consent.

414—Advanced Writing of Poetry (3). Advanced poetry writing designed for graduate students, with the intention of producing work of professional quality. Prerequisites: instructor's consent, 313 and 314, except by special consent.

416—History of Criticism (3). Principles and practice of selected critics from Plato through Matthew Arnold.

417—Studies in the English Language (3) (same as Linguistics 417). Descriptive and historical studies, ranging from the Germanic origins to modern syntactic analysis.

420—Beowulf (3). Close reading of the Old English poem. Prerequisite: 318 or equivalent.

424—Medieval Drama (3). Surveys English drama from 1300 to 1500, emphasis on craft cycles and morality plays.

425—Studies in Chaucer (3). Problems of modern scholarship and criticism. Prerequisite: 325 or equivalent.

426—Studies in Medieval English Literature (3). Representative works, such as The Pearl and Sir Gawain and The Green Knight, in the original language.

430—Spenser (3). The Faerie Queen and selected minor works.

431—Studies in Tudor Literature (1-4). Study of limited number of major Tudor authors, considered in relation to particular literary tradition. May be repeated to a maximum of six hours.

433—Studies in Tudor and Stuart Drama (3). Intensive study of one, two or three of such major Tudor-Stuart playwrights as Marlowe, Jonson or Ford.

435—Studies in Shakespeare (3). Study of selected histories and comedies in light of current scholarship.

436—Studies in Shakespeare (3). Study of selected tragedies in light of current scholarship.

445—Milton (3). Intensive study of Milton's poetry and prose with particular emphasis on modern scholarship.

451—Studies in Early Seventeenth-Century Poetry and Prose (3-6). English literature from 1600-1660. Bacon, Burton, Browne, metaphysical and Cavalier poets and prose writers of the Puritan Commonwealth. May be repeated once.

455—Studies in Restoration and Early Eighteenth-Century Literature (3). Intensive study in either the Restoration or the early 18th century. Selected readings in Dryden, Rochester and the Restoration dramatists Defoe, Swift, Pope or Gay.

456—Studies in Literature of the Later Eighteenth Century (3). Intensive study of major writers 1740-1800, normally excluding the novelists. Selected readings in Johnson, Boswell, Goldsmith, Reynolds, Burke, Gibbon and their contemporaries.

457—Studies in Eighteenth-Century Fiction (3). Intensive study of limited number of Restoration and 18th-century novelists.

464—The Earlier Romantics (3). Selected studies in the earlier generation of romantics: Blake, Wordsworth and Coleridge.

465—The Later Romantics (3). Selected studies in Byron, Shelley, Keats and their circle.

466—Studies in Victorian Poetry (3). Intensive study of limited number of Victorian poets.

467—Studies in Victorian Literature (3). Selected writers of the period.

468—Studies in Nineteenth-Century Fiction (3). Intensive study of a limited number of Victorian novelists.

471—Studies in American Literature (3-12). Selected American writers of the 19th century.

478—American Literature 1865-1914 (3). Intensive study of major American writers of the period.

485—Studies in Folklore (3). A focus on the roots of folklore scholarship and methodology and their evolution to modern approaches to the study of oral, traditional verbal genres and their performance in natural folk groups. Prerequisites: graduate standing or instructor's consent.

490—Research (cr. arr.). Leads to preparation of dissertation.

491—Studies in Modern Literature (3). Intensive study of one or more major modern writers.

492—Studies in Modern Criticism (3). Principles and practices of selected modern critics.

493—Studies in Contemporary Literature (3). Intensive study of one or more major contemporary writers.

495—Studies in Modern Drama (3). Detailed consideration of principal British and American playwrights of the 20th century. Focus placed on several playwrights and their significance in the development of the modern drama.

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. Prerequisites: undergraduate or graduate work in the field and instructor's consent. Offered as needed.

Entomology

College of Agriculture, Food and Natural Resources
1-87 Agriculture Building (314)882-7894

FACULTY

G. Michael Chippendale, chairman, professor, PhD, University of Wisconsin

Marc J. Linit, director of graduate studies, associate professor, PhD, University of Arkansas

Mahlon L. Fairchild, professor, PhD, Iowa State University

Robert D. Hall, professor, PhD, Virginia Polytechnic Institute

Armon J. Keaster, professor, PhD, University of Missouri-Columbia

Charles O. Knowles, professor, PhD, University of Wisconsin

Darryl P. Sanders, professor, PhD, Purdue University

Thomas R. Yonke, professor, PhD, University of Wisconsin

English
Entomology

Dean Barry, adjunct professor, PhD, Texas A&M University
David M. Daugherty, adjunct professor, PhD, North Carolina State University
Carlo M. Ignoffo, adjunct professor, PhD, University of Minnesota
Elaine A. Backus, associate professor, PhD, University of California-Davis
Flernoy G. Jones, associate professor, PhD, Mississippi State University
Ralph E. Munson, associate professor, PhD, Iowa State University
Mathew H. Greenstone, adjunct associate professor, PhD, University of California-Berkeley
Arthur H. McIntosh, adjunct associate professor, ScD, Harvard University
William M. Steiner, adjunct associate professor, PhD, University of Hawaii
Wayne C. Bailey, assistant professor, PhD, Iowa State University
Bruce A. Barrett, assistant professor, PhD, Washington State University
Robert W. Sites, assistant professor, PhD, Washington State University
Thomas A. Coudron, adjunct assistant professor, PhD, North Dakota State University
William C. Rice, adjunct assistant professor, PhD, University of Nebraska

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 and biochemistry; systematics; and toxicology.

The department has eight major research laboratories totaling 7,000 square feet, 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 electron microscopes and chemical and spectroscopic laboratories. Occupying 2,000 square feet, the entomology research museum provides many opportunities for research in systematic entomology. The collection, including insects, spiders and mites, is the largest in the state.

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 and the USDI National Fisheries Contaminant Research Center, both in Columbia.

Research assistantships are available to qualified students. The annual stipend for 1990-91 is $8,918 for students pursuing the MS degree and $10,266 for those pursuing the PhD degree. In addition, several scholarship awards are given annually.

For further information, write the Director of Graduate Studies or a specific staff member, Department of Entomology, 1-87 Agriculture Building, Columbia, Mo. 65211.

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 examination 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 (cr. arr.). Instruction in select subject matter areas in the field of entomology.

204—General Entomology (3-4) WI (same as Biological Sciences 204). Biology, classification evolution and the ecology of insects. For upperclass students in agriculture, biological sciences, education, fisheries and wildlife. Prerequisite: Biological Sciences 10 or 11 or equivalent.

210—Forest Entomology (3) (same as Natural Resources 210). Primarily for forestry students, open to others by arrangement. Life histories, habits, injuries, methods of controlling the more important insect pests of forests and forest products.

300—Problems (cr. arr.). By arrangement, students may take special problems in different entomology fields as preparation for research. Prerequisites: 10 hours of entomology and biological sciences.

301—Topics in Entomology (cr. arr.). Instruction in select subject matter areas in the field of entomology. Prerequisites: 110, 204 or 210.

302—Comparative Morphology of Insects (4). Comparative study of external and internal structures and systems of insects, with emphasis on structure-function relationships. Prerequisites: 110 or 204.

304—Systematic Entomology (3) (same as Biological Sciences 304). Taxonomy of insects, emphasizing biology and classification of orders and major families. Insect collection required. Prerequisites: 110 or 204 or 10 hours of biological sciences.

306—Aquatic Entomology (3). Identification, life histories, ecology of aquatic arthropods; emphasizes fresh-water insects. For students of wildlife, fisheries management, aquatic biology and advanced entomology. Prerequisites: 110 or 204 and Biological Sciences 11 and 304 or equivalent.

312—Insect Pest Management for Plant Protection (3). Identification and importance of insect pests of crops, detection techniques, economic injury levels, and recent developments in control technologies of importance to insect management decisions. Prerequisites: 204 or equivalent.

316—Principles of Insect Physiology (4) (same as Biological Sciences 316) (three hours-lecture, two hours-lab). Major concepts of insect physiology emphasizing functions of organ-systems sensory physiology hormones in development and nutrition. Prerequisites: 204 and 302 or equivalent.

321—Entomological Literature and History of Entomology (2). Surveys entomological literature from early to modern times. History of development of the science and emphasizes prominent entomologists and their contributions. For advanced entomology students. Prerequisite: 10 hours of entomology.

322—Biological Control of Insects (3). Presents principles of biological control of insects, emphasizing parasites, predators, diseases of insects and characteristics of natural insect populations. Prerequisites: 319 and 304 or instructor's consent.

350—Special Readings (cr. arr.). 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).

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.

400—Problems (cr. arr.). Advanced individual studies; including minor research problem.

410—Seminar (cr. arr.). Reviews of current literature, reports on original investigations. Prerequisite: 10 hours of entomology.

415—Medical and Veterinary Entomology (3). Insects, related pests of humans and animals. Special attention to those transmitting diseases. For advanced students in entomology, medicine and sanitary engineering. Prerequisites: 110 or 204 and 304 or instructor's consent.

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: 101, 204 or 210, Statistics 207 and Biological Science 362.

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 of entomology or instructor's consent.

450—Research (cr. arr.). Original investigation not leading to preparation of dissertation.

490—Research (cr. arr.). Original research in economic entomology, biological control of insects, insect taxonomy, toxicology, morphology, physiology, ecology, behavior, forest entomology, medical and veterinary entomology. Reading knowledge of French and German is desirable. Prerequisite: 20 hours of entomology.

PEST MANAGEMENT

209—Principles of Weed Management (4) (same as Agronomy 209 and Horticulture 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.

305—Theory and Concepts of Plant Pathology (3) (same as Plant Pathology 305 and Natural Resources 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 (314)882-7224

FACULTY

Ruth Brent, chairwoman, associate professor, PhD, University of Minnesota

Ronald Phillips, director of graduate studies, assistant professor, ArchD, University of Michigan

Richard Helmick, professor, MFA, The Ohio State University

Gary Hennigh, associate professor, MFA, University of Colorado

Martha Folk, assistant professor, MLA, University of Michigan

Pat Hilderbrand, assistant professor, MA, University of Missouri-Columbia

Sandra Rawls, assistant professor, PhD, Virginia Polytechnic Institute and State University

John Pruitt, instructor, MArch, Washington University

Howard Marshall, adjunct associate professor, PhD, Indiana University

DEGREES: MA and MS in environmental design and PhD in human environmental sciences with an emphasis in environmental design.

Three specialization areas are offered at the master's and doctoral levels:
- environmental and behavior studies
- design education
- historic preservation (interdisciplinary)

Career opportunities for graduates of the department have included leadership positions in professional design and consulting practices in industry, government and education, in university extension and in academic and administrative positions in higher education and research.

See **Human Environmental Sciences** in this section for general information.

Additional information may be obtained from the Director of Graduate Studies Program Coordinator, Department of Environmental Design, 137 Stanley Hall, Columbia, Mo. 65211.

COURSES

244—History of Environmental Design to 1750 (3). An in-depth study of housing and interior styles to the Industrial Revolution. Prerequisite: Art History 10 or 11.

245—History of Environmental Design after 1750 (3). An in-depth study of housing and interior styles after the Industrial Revolution. Prerequisite: Art History 10 or 11.

247—Interior Design II (3). Studio experience in designing for business and commercial interiors; programming, design, cost estimating, client presentation; and selection of furnishings, office systems, materials and other products. Prerequisites: 141, 142, 146, 147 and 245.

248—Housing Design I (3). Studio experience in design of residences; interior space planning, trafficways; site planning client and working drawing; and use of technical and design information from prerequisite course. Prerequisites: 43, 142 and 147.

300—Problems (cr. arr.). Supervised independent work. Prerequisites: 200-level course in field of problem, junior or senior standing and instructor's consent.

318—Topics (cr. arr.). Selected current topics in field of interest.

340—Design and Behavior (3). Review of theories and empirical research relating to physical environment and behavior, and design programming and post occupancy evaluation of built environments. Prerequisites: junior standing, three hours in sociology and three hours of psychology or Human Development and Family Studies 225 and 363.

341—Computer-Graphic Applications to Design (3). Introduces applications of computer graphics to design and art, including previsualization, drafting and creative development. Using a variety of program packages for graphic output, pure and applied design will be generated. Prerequisite: junior standing.

342—Design Communication II (3). Advanced studio course in techniques and conventions of graphic communication as aids in the design process. Prerequisite: 142.

346—Housing Concepts and Issues (3). With emphasis on design, explores housing policy, regulations, codes and programs, ecological perspective of environment/behavior issues in housing, housing conservation and preservation, financial issues, trends and projections. Prerequisites: junior standing, three hours in sociology, three hours of psychology and three hours of economics.

347—Interior Design III (3). Design of residential and contract interiors for actual clients, complete design process (not including installation) and use of technical and design information from prerequisite courses. Prerequisites: 247, 248, 340 and 342.

348—Housing Design II (3). Advanced studio experience in housing design, emphasis on problem solving techniques, and use of design and technical information from prerequisite courses. Prerequisites: 146, 245, 248 and 346 (245 as a co-prerequisite or prerequisite).

349—Advanced Design studio (3-12). Major studio design project critiqued by a panel at the end of semester. Prerequisite: 347 or 348.

350—Readings (cr. arr.). Readings in recent research materials. Prerequisite: graduate standing.

355—Recent Trends (cr. arr.). For upperclass and graduate students who wish additional knowledge and understanding in specific subject matter areas.

390—Field Training (cr. arr.). 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 (cr. arr.). 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—Research Methods in Environmental Design (3). A comparative case study of classic and current studies in housing and design, with emphasis on research and methodologies employed. Lectures and seminar discussions. Prerequisites: introductory-level statistics and instructor's consent.

415—Readings (cr. arr.). Readings in recent research materials. Prerequisite: graduate standing and 350.

418—Topics (cr. arr.). Selected current topics in field of interest.

441—Advanced Interior Design (4). Design of modern functional interiors, modern adaptations of historic material, and design for residential and professional establishments. Prerequisites: 342, 346 and instructor's consent.

450—Research (cr. arr.). Independent research not leading to a thesis. Research project and report required.

490—Research (cr. arr.). Independent research leading to thesis or dissertation.

Extension Education

College of Agriculture, Food and Natural Resources
103 Whitten Hall (314)882-4517

FACULTY

Robert E. Thomas, chairman, director of graduate studies, professor, PhD, University of Idaho

Richard J. McCallum, assistant professor, PhD, University of Nebraska

DEGREE: MS in extension education

The program is designed for students whose interests lie in the fields of extension or informal adult education. Course work includes program development, evaluation, adult learning, educational methods, organization and administration.

The department, cooperating closely with related areas of study, encourages degree candidates to select a minor or an area of concentration from several departments in agricultural education, community development and sociology as well as to take relevant courses in the College of Education. Appropriate emphasis is given to research and its relationship to the extension function of a university.

The department provides access to numerous non-cataloged extension and adult education materials prepared by state and national organizations.

Staff members hold joint appointments in the department and in the extension division. This arrangement gives students access to field training and opportunities for direct experience and education in the programs of the extension division.

MASTER'S DEGREE: Admission is limited to those students who have a minimum of two years of extension or related informal teaching experience. An applicant with a 3.0 (A=4.0) or the equivalent undergraduate GPA during the last two years of course work may be admitted on the basis of this record and three letters of reference. Grade trends, performance in the major area of study, experience and maturity may qualify a student where the undergraduate GPA is less than 3.0.

The MS program, a minimum of 32 semester hours of course work, with at least 16 hours at the 400 level, is selected in consultation with an assigned adviser.

A thesis is not required, but each candidate must complete a special project research report, carrying a maximum of four credit hours.

COURSES

201—Topics in Extension Education (1-3). Instruction in select subject matter areas in the field of extension education. Prerequisite: junior standing.

210—Fundamentals of Communications (3). Mass communications media and visual teaching aids available to workers serving agriculture. Prerequisite: junior standing.

220—The University's Public Service Mission (2-3). Provides an overview of both cooperative extension and general extension as they exist within the mission of all land-grant universities. The historical development, current status and future outlook for University Extension will be reviewed.

300—Problems (1-4). Opportunity to apply journalism skills to agricultural or extension subject matter and an opportunity to get an integrated picture of communications process within single medium or across media. Prerequisite: junior standing, or instructor's consent.

306—Extension Communication Principles and Their

Application (3). Extension communication principles underlying successful work with people in educational settings.
320—Agricultural Media (3). Provides background, knowledge of trends and experience with agricultural media. Prerequisites: six hours of journalism, including News 105, 12 hours of agriculture, junior standing or instructor's consent.
400—Problems (cr. arr.). Independent investigations of extension problems.
403—Program Development and Evaluation (3). Program development principles, teaching plans and evaluation principles applied to extension program development. Prerequisite: instructor's consent.
405—Extension Organization and Administration (3). Principles of administration and organization and their application to extension work. Prerequisite: instructor's consent.
406—Fundamentals of Extension Teaching of Adults (3). Recommended for students who have work experience in extension or another informal adult education agency in the United States. Prerequisite: instructor's consent.
408—Preparing Manuscripts for Scientific Journals (1). Introduces students to methods of planning, selecting, preparing, presenting and submitting articles for publication in scientific journals. Prerequisite: instructor's consent.
410—Seminar (cr. arr.). Presentation, discussion of extension studies and literature.
411—Topics in Extension Education (cr. arr.). Current and new developments in extension education. Prerequisite: departmental consent.
450—Research (cr. arr.). Independent investigations not leading to thesis, but terminating in research report.

Family and Community Medicine

School of Medicine
M228 Medical Sciences Building (314)882-2996

FACULTY

Jack M. Colwill, chairman, professor, MD, University of Rochester
Michael C. Hosokawa, director of graduate studies, professor, EdD, University of Oregon
Gerald T. Perkoff, associate chairman, Curators Professor, MD, Washington University-St. Louis
William C. Allen, professor emeritus, MD, MSPH, University of Nebraska
A. Sherwood Baker, professor emeritus, MD, MSPH, University of Illinois
Robert L. Blake Jr., professor, MD, Washington University-St. Louis
Margaret A. Flynn, professor emeritus, PhD, University of Missouri-Columbia
Hans O. Mauksch, professor emeritus, PhD, University of Chicago
John K. Glenn, associate professor, PhD, MSPH, University of Missouri-Columbia
Michael LeFevre, associate professor, MD, MSPH, University of Missouri-Columbia
Georgia B. Nolph, associate professor, MD, Women's Medical College of Pennsylvania
D. Thomas Vernon, associate professor, PhD, University of Chicago
Harold A. Williamson Jr., associate professor, MD, MSPH, Case Western Reserve University
Steven C. Zweig, associate professor, MD, MSPH, University of Missouri-Columbia
James Campbell, assistant professor, PhD, University of Missouri-Columbia
Bernard G. Ewigman, assistant professor, MD, MSPH, University of Missouri-Columbia
Elizabeth Garrett, assistant professor, MD, MSPH, University of Missouri-Columbia
Larry W. Lawhorne, assistant professor, MD, University of Virginia
Daniel C. Vinson, assistant professor, MD, University of North Carolina
Harley Wright, assistant professor, MSPH, University of Missouri-Columbia
Allen Daugird, assistant professor of clinical family and community medicine, MD, University of North Carolina
Melanie E. Elfrink, assistant professor of clinical family and community medicine, MD, University of Missouri-Columbia
Ann Grunwald, assistant professor of clinical family and community medicine, MD, University of Wisconsin
Mark Grunwald, assistant professor of clinical family and community medicine, MD, Stanford University
Andrew A. Nelson, assistant professor of clinical family and community medicine, MD, University of Texas-Houston
David A. Nichols, assistant professor of clinical family and community medicine, MD, University of Missouri-Columbia
Donald C. Spencer, assistant professor of clinical family and community medicine, MD, University of California-Los Angeles
Hope L. Tinker, assistant professor of clinical family and community medicine, MD, University of Missouri-Columbia
Janis C. Dally, clinical assistant professor, MSPH, University of Missouri-Columbia
Vicki Straub, clinical assistant professor, PhD, University of Arizona

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, Department of 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 the 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.
330—Statistical Aspects of Public Health (3). Classification and summarization of data used in public-health practice and research. Probability, sampling and hypothesis testing. Correct and incorrect use of statistics in the literature. Prerequisite: concurrent registration in 420 or instructor's consent.
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 community health. Prerequisites: graduate standing and 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. Prerequisite: concurrent registration in 330 or equivalent or instructor's consent.
421—Advanced Epidemiology (3) (same as Veterinary Microbiology 421). Advanced epidemiologic theory and methods in the study and control of infectious and noninfectious diseases. Prerequisite: 420 or instructor's consent.
422—Research and Evaluation in Community Health Education (3). Principles of designing community health research and techniques of community health education program evaluation.
440—Public Health Administration (3). Local public and community health administration and functions. Influences of state and federal program authorities and financing. Includes community assessment, program priorities, staffing and budgeting for a local health program. Prerequisites: 330 and 420, or instructor's consent.
450—Research (cr. arr.). Original research in community health not leading to a thesis but requiring a formal research report.
490—Research (cr. arr.). Independent investigation of some problem in community health to be presented as a thesis.
491—Field Experience in Community Health (cr. arr.). Supervised field experience in approved agencies practicing health and preventive medicine. Opportunity for observation and service participation in various fields of public health.

Finance

College of Business and Public Administration
214 Middlebush Hall (314)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. Program information and requirements are given under the area heading **Business Administration.**

COURSES

203—Corporation 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: junior standing, Economics 51, six hours of accounting and Statistics 150.
218—Personal Risk Management and Insurance (3). Teaches the importance of risk in personal endeavors and the intelligent handling of such risks. Life, health, auto, homeowner and liability risks are treated. Prerequisite: sophomore standing.
235—Time Series Analysis and Index Numbers (3). Analyzes time series, index number theory and practice. Prerequisites: Statistics 31 and junior standing.
300—Problems (cr. arr.). Independent study, reports on selected topics.
305—Topics in Finance (3). Selected topics in finance, insurance or real estate. Offered on an experimental basis.
313—Insurance Theory, Employee Benefits and Pension Plan (3). Study of group insurance theory and employee financial security. Discusses group life, health, auto,

homeowner's insurance, employee benefit programs and pension plans. Prerequisite: junior standing.

318—Risk Management for the Firm (3). Analysis of the pure and speculative risks faced by the firm and study of risk management within the firm. Strategies for minimizing the adverse consequences of risk are developed. Prerequisite: 203.

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: 203. Co-requisite: Accountancy 236 or 305.

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, international monetary system and exchange rate determination. Prerequisites: 323 and 333.

333—Investments (3). Security valuation and analysis and formulation of personal and professional investment programs. Prerequisite: 203. Co-requisite: Accountancy 236 or 305.

338—Business and Economic Reporting (3) (same as Journalism 338, Management 338 and Marketing 338).

340—Principles of Real Estate (3). Principle factors influencing land use and practices in real estate business. Prerequisites: 203, Management 254 or senior standing.

341—Real Estate Appraisal (3). Procedures for valuing industrial, commercial and residential realty by market, income and replacement cost approaches. Case method and field investigations. Prerequisite: 340.

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 and investment qualities of real estate. Prerequisite: 340.

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 and financial institutions as instruments of public policy. Prerequisites: 203 and Economics 229.

353—Security Analysis (3). Classifies and analyzes securities, markets and industries. Formulation of investment policy for institutions and aggressive personal investors. Prerequisites: 333 and Accountancy 236 or 305.

355—Portfolio Management (3). Development and application of the principles of modern portfolio 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.

363—Management of Financial Institutions (3). Operating principles of major financial intermediaries, including commercial banking, savings, insuring, lending and investing institutions. Analysis of cases and study of current problems. Prerequisite: 343.

380—Statistical Forecasting (3) (same as Management 380, Marketing 380 and Statistics 380).

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 and Marketing 418). Role of theory, principles, concepts and hypotheses in research, models, data collection, basic and applied research, problem solving and decision making, and 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 and long-term financing. Extensive use of cases. Prerequisite: 423.

433—Security Markets and Investments (3). Valuation of securities including stocks, bonds, options and futures and 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 and trade of private multinational business. Analysis of cases illustrating theoretical, environmental, functional and institutional considerations.

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.

461—Financial Markets and Institutions (3). Role and functions of financial intermediaries in accumulation and allocation of funds and distribution of risk; structure of financial markets and the financial system. Prerequisites: Business Administration 344 and Economics 332.

463—Commercial Bank Administration (3). Study and analysis of policies, goals, practices and techniques of commercial bank administration. Prerequisite: 423.

473—Case Research and Development (3). Planning, conducting, researching and writing business cases.

480—Current Topics Seminar in Finance (1-3). Reading and critical evaluation of selected current finance literature and research. May be repeated. Prerequisite: PhD students only.

490—Research (cr. arr.). Thesis research for PhD degree.

Fisheries and Wildlife

School of Natural Resources
1-74 Agriculture Building (314)882-7045

See Natural Resources for description of programs.

Food Science and Nutrition

College of Agriculture, Food and Natural Resources
122 Eckles Hall (314)882-4113

FACULTY

William C. Stringer, chairman, director of graduate studies, professor, PhD, University of Missouri-Columbia

Maynard E. Anderson, professor, PhD, University of Missouri-Columbia

Milton E. Bailey, professor, PhD, Louisiana State University

Ruth E. Baldwin, professor emeritus, PhD, University of Wisconsin

Harold J. Bassett, professor emeritus, PhD, University of Wisconsin

Owen J. Cotterill, professor emeritus, PhD, The Ohio State University

Joseph E. Edmondson, professor emeritus, PhD, Iowa State University

Marion L. Fields, professor, PhD, Purdue University

Dennis T. Gordon, professor, PhD, University of Connecticut

Harold B. Hedrick, professor, PhD, University of Missouri-Columbia

Robert T. Marshall, professor, PhD, University of Missouri-Columbia

H. Donald Naumann, professor emeritus, PhD, University of Missouri-Columbia

Nan Unklesbay, professor, PhD, University of Wisconsin-Madison

Fu-Hung Hsieh, associate professor, PhD, University of Minnesota

Robert F. Lukowski, associate professor, EdD, University of Massachusetts

Andrew Clarke, assistant professor, PhD, Colorado State University

Esther W. Digh, assistant professor, PhD, University of Missouri-Columbia

Hildegarde Heymann, assistant professor, PhD, University of California-Davis

Douglas L. Holt, assistant professor, PhD, University of Nebraska

Ruth MacDonald, assistant professor, PhD, University of Minnesota-St. Paul

Dean S. Shelley, assistant professor, MS, University of Missouri-Columbia

Gary Weisman, assistant professor, PhD, University of Nebraska-Lincoln

DEGREES: MS and PhD in food science

Faculty teach graduate courses in St. Louis each semester in the evenings. Designed for employees in the food industry, the courses enable them to obtain a MS degree. Students enroll for a minimum of 30 credit hours. Information can be obtained from Extension Teaching at (800)545-2604.

Graduate work in the Department of Food Science and Nutrition is designed to prepare students for research or advanced professional careers in the food industry. Selected careers include teaching and research at the college level, research and development for private industry or the federal government, food plant supervision, technical operation, quality assurance, product development, nutrition, distribution, food service and food regulatory work.

Departmental cooperation with the food industry is excellent in both on- and off-campus programs. 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.

Additional information pertaining to courses of study, assistantships, or other material can be obtained from the department chairman.

Submit application for assistantships or fellowships to the Department of Food Science and Nutrition, 122 Eckles Hall, by January 1 of each year.

THE MASTER'S DEGREE is designed pri-

marily 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 of science or bachelor of arts degree and an undergraduate record that indicates 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 non-thesis 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 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
- 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.
- an acceptable master's degree program
- acceptance of a dissertation proposed and defended by the student

To satisfy degree requirements, a candidate must complete the program of study, demonstrate proficiency in one foreign language or complete nine credit hours in a designated collateral field; 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 (cr. arr.). Supervised study in a specialized phase of food science and nutrition.

204—Advanced Meats (3) (same as Animal Science 204). Carcass yields, cut out values, fabrication, boning, cutting, prepackaging and pricing. Wholesale, retail and institutional distribution. Includes field trip.

224—Meat Selection and Identification (3) (same as Human Nutrition and Foods 224). Meat with reference to selection, identification, utilization and wholesale/retail buying. Includes field trip. Prerequisite: Human Nutrition and Foods 121 or instructor's consent.

228—Principles of Food Systems Management (3-4) (same as Human Nutrition and Foods 228).

235—Commercial Food Production Management (5). Identifies and applies the skills necessary to plan, produce, and serve meals to customers in a commercial setting. Prerequisites: 121, Chemistry 1, and junior standing.

240—Strategic Management for Hotels and Restaurants (3). Applies functions and tools of business management to the specialized operation of hotels and restaurants. Prerequisites: 140, Statistics 31, and Accountancy 36 or instructor's consent.

250—Physical Principles for Food Processing (3) (same as Agricultural Engineering 250). Fundamentals of food processing unit operations. Engineering properties of foods. Prerequisites: Mathematics 10, Physics 21 or instructor's consent.

255—Hotel and Restaurant Human Resources Management (3). Recruitment, training, management of personnel required for operation of hotels & restaurants at all employment levels. Prerequisites: introductory course in psychology, sociology, hotel and restaurant management, and/or instructor's consent.

275—Hotel and Restaurant Sales and Marketing Management (3). Marketing of hospitality services: human factors, consumer demand, planning, professional considerations. Promotional methods: advertising, direct mail, outside/"in-house" selling, merchandising, pricing, public relations, sales promotion. Prerequisites: Marketing 204 and economics.

300—Problems (cr. arr.). Advanced problems in a selected field of food science and nutrition.

301—Topics in Food Science and Nutrition (cr. arr.). Instruction in specific subject matter areas in the field of food science and nutrition.

305—Food Analysis (3). The quantitative determination of the constituents of food. Prerequisites: analytical chemistry and biochemistry.

309—Food Chemistry I (5). Structure, composition and chemical properties of food. Prerequisite: 12 hours of chemistry, including biochemistry.

330—Food Processing: Plant Foods (4). Survey of processing relating to the quality and preservation of foods derived from plants. Operations covered include drying, canning, freezing, baking, brewing. Prerequisites: 30, 250 and Biochemistry 110 or higher.

334—Food Processing: Muscle Foods (4). Characteristics of muscle foods and related products. Includes processing operations, manufacturing and merchandising. Field trips to meat research laboratory and industrial plants. Prerequisites: 250 and one course in biochemistry (110 or higher).

335—Food Processing: Milk and Dairy Products (4). Physical and chemical properties of transformation of raw milk into finished products. Includes selected unit processes, tests of quality and economics of marketing. Prerequisites: 250 and one course in biochemistry.

337—Food Processing: Eggs and Egg Products (2). Application of science to the production, preservation, processing and utilization of shell eggs and egg products (liquid, frozen, dried and speciality food products). Prerequisites: one course in biochemistry and 250.

340—Case Studies and Research in Hotel and Restaurant Management (3). Applies business, economic, and social science principles to problem situations found in hotel and restaurant management. Writing Intensive. Prerequisites: 240, 255 or instructor's consent.

345—Advanced Food Production Technology for Food Services (3). Lecture course with project in food service laboratory, utilization of renewable and non-renewable resources within food service operations and principles of effective food production technology emphasized. Prerequisite: 235 or instructor's consent.

360—Food Quality and Sanitation (3). Interprets regulations concerned with protection of the nation's food supply. Applies protection and sanitary practices to ensure consumers of wholesome and healthful foods. Prerequisite: general microbiology.

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, organic chemistry and general microbiology.

373—Food Microbiology Laboratory (2). Examination of foods for microorganisms and characterization of major species. Prerequisite: 372 or concurrently.

375—Sensory Analysis of Food (4) (same as Human Nutrition and Foods 375). Principles, theory and methodology of sensory analysis. Prerequisite: a statistics course.

390—Internship in Food Science and Nutrition (1-6). Combines study, observation and employment in an area of food science and nutrition. Written reports and faculty evaluation. Prerequisites: 90 hours, including three courses in department and instructor's consent.

400—Problems (cr. arr.). Individual studies include a minor research problem.

401—Topics in Food Science and Nutrition (cr.arr.). 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 and making oral presentations. Prerequisite: graduate standing.

404—Meat Investigations (3). Discussion of literature, special reports, assigned readings, techniques and 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.

409—Food Chemistry II (4). Study of chemical content of food, emphasizing aspects that exist uniquely in food. Prerequisite: 309.

410—Seminar (1). Provides students with opportunities for in-depth development of advanced aspects of food science through reviews of research in progress and of current scientific publications.

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, nutrition or 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: six hours of microbiology and five hours of organic or biological chemistry.

450—Research (cr. arr.). Original investigations, usually in connection with one of the research projects of the Agricultural Experiment Station. Written report required.

470—Advanced Studies in the Science and Technology of Food Preservation (4). Thermal processing of canned foods, fermentation, radiation and freeze-dehydration and food additives. Current literature, lectures and lab discussion. Prerequisites: 309, 330, 372 or instructor's consent.

475—Advanced Sensory-Instrumental Analyses (3). Integration of human sensory perception with instrumental analyses. Statstical analyses will be emphasized. Advances in sensory techniques will be discussed. Prerequisites: 375 and Statistics 395.

490—Research (cr. arr.). Original investigation of advanced nature, leading to dissertation.

Forestry

School of Natural Resources
1-74 Agriculture Building (314)882-7045

See Natural Resources for description of programs.

Genetics Area

Graduate School
108 Tucker Hall (314)882-7933

FACULTY

Donald Miles, chairman, director of graduate studies, professor of biology, PhD, Indiana University
Allan B. Burdick, professor emeritus of biology, PhD, University of California-Berkeley
Arun K. Chatterjee, professor of plant pathology, PhD, University of Guelph
Edward H. Coe Jr., professor of agronomy, PhD, University of Illinois
Abraham Eisenstark, professor of biology, PhD, University of Illinois
Charles S. Gowan, professor emeritus of biology, PhD, Stanford University
Thomas J. Guilfoyle, professor of biochemistry, PhD, University of Illinois
Richard E. Hillman, professor of child health and biochemistry, MD, Yale University
Gordon Kimber, professor of agronomy, PhD, University of Manchester
Myron G. Neuffer, professor of agronomy, PhD, University of Missouri-Columbia
Steven G. Pueppke, professor of plant pathology, PhD, Cornell University
Gyorgy P. Redei, professor of agronomy, CS, University of Budapest
Ernest R. Sears, professor emeritus, PhD, Harvard University
Om P. Sehgal, professor of plant pathology, PhD, University of Wisconsin
Linda F. Chapman, associate professor of biology, PhD, University of California-Los Angeles
Larry L. Darrah, associate professor of agronomy, PhD, Iowa State University
John D. David, associate professor of biology, PhD, Vanderbilt University
Gregory G. Doyle, associate professor of agronomy, PhD, University of Illinois
J. Perry Gustafson, associate professor of agronomy, PhD, University of California-Davis
Russell L. Larson, associate professor of agronomy, PhD, University of Illinois
Joyce A. Mitchell, associate professor of child health, PhD, University of Wisconsin
Charlotte Parker, associate professor of microbiology, PhD, University of California-Los Angeles
Joseph C. Polacco, associate professor of biochemistry, PhD, Duke University
David A. Sleper, associate professor of agronomy, PhD, University of Wisconsin
George P. Smith, associate professor of biology, PhD, Harvard University
Richard J. Wang, associate professor of biology, PhD, University of Colorado
Jack B. Beckett, assistant professor of agronomy, PhD, University of Wisconsin
Karen L. Bennett, assistant professor of microbiology, PhD, State University of New York-Buffalo
John F. Cannon, assistant professor of microbiology, PhD, University of Wisconsin
Karen C. Cone, assistant professor of biology, PhD, Duke University
Anne L. McKendry, assistant professor of agronomy, PhD, University of Manitoba
Kathleen J. Newton, assistant professor of biology, PhD, Indiana University
Mary L. Polacco, assistant professor of biochemistry, PhD, Duke University
James E. Schoelz, assistant professor of plant pathology, PhD, University of Kentucky
John C. Walker, assistant professor of biology, PhD, University of Georgia

INTERDISCIPLINARY AREA PROGRAMS: MS and PhD in genetics area

The genetics area program is designed to provide broad, individualized training, preparing graduates for teaching and research careers in genetics.

Applicants with a GPA of B (A=4.0) and higher during the last two years of undergraduate course work or equivalent and indications of the potential for success in graduate studies are considered. Particular consideration is given to an applicant's preparation in the sciences. Application should be made to the director of graduate studies. A complete application consists of official transcripts, letters of recommendation, scores on the GRE (general test and subject test in biology) and the form Application for Admittance to the Division of Biological Sciences for Graduate Studies.

Applicants are expected to have a broad background in biology, an introductory course in genetics equivalent to that offered at MU and one or more courses in each of the following: organic chemistry, biochemistry, mathematics (preferably through calculus), physics and statistics. Deficiencies in these subjects are to be remedied promptly after admission.

In addition to the requirements of the Graduate School, the minimum requirements for the degree are outlined below.

MASTER'S DEGREE: Biological Sciences 202 and 241 (no-credit status); advanced courses in genetics and biochemistry; two seminars and thesis (on approval, credits in Biological Sciences 400 may be substituted). These requirements and others are determined in consultation between the student and the adviser.

DOCTORAL DEGREE: Biological Sciences 202 and 241 (no-credit status), advanced courses in genetics and biochemistry; advanced courses in physiology and metabolism; three seminars and some form of teaching in biology, which prepares the student to enter a teaching career. Other advanced courses and language requirements are prescribed by the student's doctoral program committee.

Geography

College of Arts and Science
8 Stewart Hall (314)882-8370

FACULTY

Christopher L. Salter, chairman, director of graduate studies, professor, PhD, University of California-Berkeley
Gail S. Ludwig, associate professor, DA, Northern Colorado University
William A. Noble, associate professor, PhD, Louisiana State University
Joseph H. Astroth Jr., assistant professor, PhD, University of Chicago
Joseph J. Hobbs, assistant professor, PhD, University of Texas-Austin
Robert Kaiser, assistant professor, Columbia University
Walter A. Schroeder, assistant professor, MA, University of Chicago
Tim Haithcoat, instructor, MA, University of Missouri-Columbia

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. Both options require 32 hours of graduate credit and prepare students for careers in applied geography, government service in such areas as 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 schools.

The department emphasizes close contact between staff and graduate students. Individualized graduate programs allow latitude in areas of specialization such as regional, cultural, economic or physical geography, cartographic design, Geographic Information Systems (GIS), applied geography, environmental studies and geographic education. Strong collateral course work in such fields as anthropology, atmospheric science, computer science, economics, geology, resource management, and history meets the special interests of many graduate students.

The faculty are occupied in an active program of research, field work (both international and domestic) and pride themselves in a creative instructional schedule.

An exceptional departmental collection of reference materials, including maps, journals, books and aerial photographs, is available to graduate students. The holdings of Ellis Library in geography and related fields are extensive and MU computer facilities are readily available. In addition, the department is home to the University's Geographic Resources Center. This facility and associated courses in geography provide a strong setting for instruction and research in GIS.

Awarded on a competitive basis, graduate teaching and research assistantships are available. Applicants desiring consideration for one of these positions should indicate this in their applications to the department.

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 may be admitted on the basis of this record alone. Certain circumstances may qualify some applicants with lower GPAs to be admitted on probation. Three letters of recommendation are required and may be used to strengthen applications.

All applicants should submit GRE scores to the department as early as possible. These scores should include the general test scores and may include the scores on the subject test in geography or other subject tests.

Address inquiries to Director of Graduate Studies, Department of Geography, 3 Stewart Hall, Columbia, Mo. 65211.

MASTER'S DEGREE: Preparation for graduate work in geography should include a minimum of 18 semester hours in undergraduate courses in geography. Students with excellent undergraduate records, including considerable work in fields closely related to geography, may be accepted for advisement with fewer undergraduate hours, but may be required to extend their graduate programs to remedy deficiencies.

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 these hours must be in courses at the 400 level. Every student must take 408. The 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 pass a comprehensive oral examination at the end of their graduate work. Students taking the thesis option must defend the thesis. The department strongly encourages all serious students to research and write a master's 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 the 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 and geographic aspects of economic growth.

225—Geography of Missouri (3). Physical, historical, cultural, economic, political geography of Missouri; regions of the state. Prerequisite: 1 or junior standing.

273—Geography of East Asia (3). Cultural, physical and historical 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. Prerequisites: 2, and junior standing or instructor's consent.

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 resources. Prerequisite: 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 a maximum of six hours. Prerequisites: upperlevel standing in geography, cartographic training and departmental consent.

296—Honors (3). Special work for honors candidates in geography.

297—Honors (3). Special work for honors candidates in geography.

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. Prerequisites: 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 six hours. Prerequisite: instructor's consent.

301—Topics in Geography (cr. arr.). 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).

305—Selected Themes in Cultural Geography (3). Case studies in the patterns and processes of human-environmental interaction. 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 land forms, 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: 111 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: 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, Geography 404 or equivalent.

340—Mexico, Central America, and the Caribbean (3). Physical environment and culture in the regional development of Mexico, Central America and the Caribbean. Prerequisites one course in geography or instructor's consent.

341—South America (3). Physical environment and culture in the regional development of South America. Prerequisites 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: 337.

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 337.

347—Geographic Information Systems (3). Introduces concepts of computer analysis of geographic data and emphasizes the techniques for handling geographic data. Application of computer-based GIS systems in course work. Prerequisite: 344.

350—Special Readings (1-3). Independent readings selected in consultation with supervisory faculty member. May be repeated to a maximum of six hours. Prerequisite: instructor's consent.

352—Geography of Africa (3). Major concepts of African geography in current and historical perspective. Prerequisites: one course in geography or instructor's consent.

366—Climates of the World (3) (same as Atmospheric Science 366).

372—Geography of South Asia (2) (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 and population. Prerequisite: junior standing.

380—Selected Themes in Political Geography (3). Study of basic writings, dominant geographers, case studies, bibliographies and development of research methods. Prerequisites: 180 and three other geography courses, or instructor's consent.

396—The Soviet Union (3). Analyses of major geographical regions, patterns, relationship and trends, with emphasis on resources and environmental questions. Prerequisites: junior standing and one course in geography, 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 six hours. Prerequisite: instructor's consent.

401—Topics in Geography (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: instructor's consent, departmental consent for repetition.

402—Field Geography (3). Techniques of geographical investigation in the field. Prerequisites: 1, 2, and four other courses in geography, or instructor's consent.

403—Bibliographical Techniques (1). Use of library materials for geographical teaching and research.

404—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: Statistics 207 or equivalent.

405—Research Methods (3). Application of scientific methods in geographic research. Critical evaluation of current geographical methodology.

406—Seminar in World Regional Geography I (1). Problems in the teaching of world regional geography on college level.

407—Seminar in World Regional Geography II (1). Continuation of course 406.

408—American Approaches to Geography (3). Directions and stages in the development of American geographic thought. Course is built around analysis of research agendas of major American geographers. Prerequisites: graduate standing in geography or instructor's consent.

410—Seminar (1-3). May be repeated to a maximum of six hours. Prerequisite: departmental consent.

416—Seminar in the Geography of Anglo-America (1-3). Readings and research on problems in the geography of the United States and Canada.

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: 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. Prerequisites: 347 or instructor's consent.

450—Research (1-6). Research not leading to thesis. May be repeated to a maximum of six hours. Prerequisite: instructor's consent.

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Geography

473—Seminar in the Geography of East Asia (3). Advanced reading, research, writing and presentation in the geography of East Asia, with emphasis generally on China. Prerequisites: 273 and graduate standing, or 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 eight hours. Prerequisite: instructor's consent.

Geological Sciences

College of Arts and Science
101 Geology Building (314)882-6785

FACULTY

Raymond L. Ethington, chairman, professor, PhD, University of Iowa

James H. Stitt, director of graduate studies, professor, PhD, University of Texas

Thomas J. Freeman, professor, PhD, University of Texas

Glen R. Himmelberg, professor, PhD, University of Minnesota

William D. Johns, professor, PhD, University of Illinois

George W. Viele, professor, PhD, University of Utah

Robert L. Bauer, associate professor, PhD, University of Minnesota

David W. Houseknecht, associate professor, PhD, Penn State University

Peter Nabelek, associate professor, PhD, State University of New York-Stony Brook

Kevin Shelton, associate professor, PhD, Yale University

Michael B. Underwood, associate professor, PhD, Cornell University

Susan Carroll, assistant professor, PhD, Northwestern University

Joesph Engeln, assistant professor, PhD, Northwestern University

DEGREES: MS and PhD in geology

The areas of specialization are carbonate petrology, clay mineralogy, sandstone petrology, geochemistry, geophysics, hydrogeology, igneous petrology, metamorphic petrology, micropaleontology, ore deposits, invertebrate paleontology, sedimentation, stratigraphy, structural geology and tectonics.

Adequate space and excellent facilities are available for research in the Geology Building, which also houses an excellent geology library. Modern and sophisticated equipment is available for supervised student use in many fields. The department maintains one of the best conodont collections in the world for teaching and research. The Geology Field Camp is in the Wind River Mountains near Lander, Wyo.

Many scholarships, assistantships, fellowships and other sources of financial aid are available. For information and applications write to Director of Graduate Studies, 101 Geology Building, Columbia, Mo. 65211.

GRADUATE PROGRAMS: Preparation for a graduate degree in geology should include a minimum of 24 semester hours in geology, plus six or more semester hours in an approved course (or equivalent experience), eight semester hours of chemistry (physical chemistry for students specializing in mineralogy, petrology or geochemistry), eight semester hours in physics, eight semester hours in analytical geometry and calculus, and three semester hours in computer science. Students specializing in paleontology should have work in invertebrate zoology and genetics. A reading knowledge of at least one foreign language is desirable.

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 must, in addition, present a score for the geology subject test of the GRE. All international students whose native language is not English must submit their TOEFL scores as a prerequisite for admission.

COURSES

206—Regional Geology of the United States (4). Geologic provinces of the United States, their tectonic-geomorphic history and their economic importance. Emphasizes orogenic regions and plate tectonics. Laboratory on interpretation of geologic maps and aerial photographs and preparation of cross-sections and subsurface maps. Prerequisite: 124.

234—Mineralogy (4). Introduction to crystallography, crystal chemistry and crystal structures. Systematic study of mineral groups. Includes identification of minerals by physical and chemical properties Prerequisite: Chemistry 11 or concurrently.

235—Optical Mineralogy (3). Identification of minerals by determination of their optical constants and principles underlying determinative methods. Prerequisite: 234. Students from other departments who have not taken 234 are admitted by special consent.

280—Internship in Geology (1-6). Geologic experience under supervision of geology faculty, but conducted away from the campus. Prerequisites: 2.75 GPA, 20 hours of geology, departmental consent. S/U graded only.

290—Honors Proseminar in Geology (3). Prerequisite: admission to department honors program.

300—Problems (1-5). Prerequisite instructor's consent.

301—Topics (cr. arr.). Organized study of selected topics. Subject and earnable credit may vary. Prerequisites: junior standing or higher, instructor's consent and departmental consent for repetition.

303—Exploration Geophysics (3). Methods of conducting and interpreting geophysical field surveys. Physical basis of seismic, gravity, magnetic and electrical methods emphasized. Prerequisites: 307, Mathematics 175, Physics 176, Computer Science 104 or instructor's consent.

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: 307 and 308.

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 2, Mathematics 80 or instructor's consent.

308—Sedimentology (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: 235.

325—Hydrogeology (3). Analysis of geologic factors related to occurrence, distribution, recovery and use of groundwater. Prerequisites: 1 or 2 and Mathematics 80 or instructor's consent.

326—Igneous and Metamorphic Petrology (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. Prerequisites: 234 and 235.

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 2, upper-level standing or instructor's consent.

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: 307 and 308.

340—Economic Geology (3-4). 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. Prerequisite: 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 12.

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.

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: 234, Chemistry 12 and Mathematics 175.

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. Prerequisite: senior/graduate in geology.

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 12 and Physics 22.

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, 308 and 234.

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 104 and an introductory geology course or instructor's consent.

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. Prerequisite: 395 or instructor's consent.

400—Problems (1-8). Prerequisites: graduate standing and instructor's consent.

401—Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary. May be repeated with departmental consent. Prerequisite: instructor's consent.

402—Continental Tectonics (3). Emphasizes the sedimentological and structural history of the continents rift valleys, trailing margins, folded belts and collision tectonics. The Ouachita orogen is emphasized. Prerequisite: graduate standing in geology.

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.

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 and 326.

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.

412—Advanced Seismology (1-4). Course content will vary. Dynamics and kinematics of the seismic source, seismogram calculations in inhomogeneous media and geophysical inverse theory. Offered as interest demands. Prerequisite: instructor's consent. May be repeated for credit.

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. Prerequisite: instructor's consent.

419—Carbonate Petrology (3). Petrography and petrology of ancient carbonates in the light of recent analogues. Prerequisite: graduate standing in geology.

420—Sandstone Petrology (3). Texture, composition and petrogenesis of sandstones. Quantitative analysis of petrographic data. Lecture and lab equally stressed. Prerequisites: 323 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: 224, upper-level or graduate standing.

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 and 326.

427—Igneous Petrology (3). Studies of the origin and evolution of magmas, with use of phase equilibria, physical properties and kinetics. Prerequisites: 235 and 326.

428—Radiogenic Isotope Geochemistry (3). Studies of the application of trace element and radiogenicisotope systematics to petrogenesis of rocks. Prerequisite: 326 or instructor's consent.

432—Introduction to Micropaleontology (3). Introductory work on microfossils. Prerequisite: 331.

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.

441—Communicating Geological Research (3). Writing, illustrating and oral presentation of geological research. Departmental requirement in the graduate student's first year of residence. Prerequisite: graduate standing. S/U graded only.

443—Advanced Aqueous Geochemistry (3). Study of mineral-water interface geochemistry. Course will cover dissolution and precipitation kinetics, absorption 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 (1-2). Evaluation of recent studies in hydrogeology and related sciences. Individual student problems in selected areas of the subject. Prerequisite: 325 or instructor's consent.

456—Scanning Electron Microscopy (2). Principles and practice of SEM analysis in geological and materials characterization applications. Prerequisite: instructor's consent.

490—Research (cr. arr.). Preparation of dissertation.

German, Russian and Asian Studies

College of Arts and Science
451 General Classroom Building (314)882-4328

FACULTY

Dennis M. Mueller, chairman, professor of German, PhD, Washington University-St. Louis

James M. Curtis, professor of Russian, PhD, Columbia University

Naomi Ritter, professor of German, PhD, Harvard University

Paul Casey, associate professor of German, PhD, Johns Hopkins University

Mary Brodnax, assistant professor of German, PhD, Johns Hopkins University

Roger Cook, assistant professor of German, PhD, University of California-Berkeley

DEGREE: MA in German

The program is designed to prepare students for admission to PhD programs, as well as 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 the subject area.

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. Opportunity for supervised teaching is available to teaching assistants.

Applicants for acceptance for advisement in 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 and at least 15 hours must be taken in German courses at the 400 level. A thesis or the equivalent, with a maximum of six hours of credit, is optional.

Courses taken outside the department should 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 department chairman.

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 (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary. Repeatable to a maximum of six hours with departmental consent. Prerequisites: sophomore standing and instructor's consent.

203—Advanced German Reading (3). Prerequisite: 3 or equivalent.

206—German Conversation and Composition II (3). Prerequisite: 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. Prerequisite: graduate standing or instructor's consent.

208—Business German (3). Conversation, composition and reading based on terminology used in business situations. Prerequisites: 106, 203 or equivalent.

275—German Classics (3). Reading and discussion of selected works by major German writers. Prerequisite: 203 or equivalent.

296—Honors in German (1-3). Special problems in German literature or linguistics. Prerequisite: consent of departmental honors director.

301—Topics in German (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated to a maximum of six hours with departmental consent. Prerequisites: junior standing and instructor's consent.

306—German Conversation and Composition III (3). Prerequisite: 206 or equivalent.

308—Enlightenment and Sturm and 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: 275 or equivalent.

313—The German Novelle (3). Prerequisite: 275 or equivalent.

315—Faust (3). Prerequisite: 275 or equivalent.

333—German Drama from 1750-1840 (3). German drama from 1750 to 1840 will be read and discussed. Prerequisite: 275 or equivalent.

334—German Drama from 1840-present (3). German drama from 1840 to the present will be read and discussed. Prerequisite: 275 or equivalent.

350—Special Readings (1-3). Independent study through readings, conferences and reports. Prerequisites: junior standing and chairman's consent.

360—Recent German Literature (3). Prerequisite: 275 or equivalent.

375—Medieval German Literature 1170-1210 (3). Analysis of major narrative and lyric poetry of the Age of Chivalry. Prerequisite: 275 or equivalent.

380—Study in the Techniques of Teaching German (3) (same as Curriculum and Instruction T380). Objectives, methods and problems related to the instruction of German. Prerequisites: 18 hours in German, or the equivalent, and chairman's consent.

381—Advanced Grammar, Syntax and Stylistics (3). Considers complicated grammatical and syntactical structures. Prerequisite: senior or graduate standing, or instructor's consent.

382—Contrastive Linguistics (3). Contrastive phonemic, morphological and syntactic analysis of English and German. Prerequisite: 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 (cr. arr.). Prerequisites: graduate standing and chairman's consent.

401—Topics in German (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated to a maximum of six hours with departmental consent.

402—Bibliography and Methods (1). Designed to acquaint students of bibliographical aids basic to research in German studies. Prerequisite: graduate standing or instructor's consent.

410—Seminar (3). Course content varies. Prerequisite: graduate standing or instructor's consent.

415—Reformation and Remaissance Literature (3). The course investigates significant works of German literature of the late 15th and 16th centuries. Prerequisite: graduate standing or chairman's consent.

450—Research (cr. arr.). Translations or creative work not leading to thesis. Credit hours arranged. Prerequisite: graduate standing or departmental consent.

460—History of the German Language (3) (same as Linguistics 460). Prerequisite: graduate standing or instructor's consent.

461—Middle High German (3) (same as Linguistics 461). Prerequisite: graduate standing or instructor's consent.

490—Research (cr. arr.). Prerequisite: chairman's consent.

HEBREW

200—Problems in Hebrew (1-3). Supervised study of Hebrew language and/or culture. May be taken for a maximum of six credits. Prerequisite: instructor's consent.

JAPANESE

200—Problems in Japanese (1-3). Supervised study in Japanese language and culture. May be taken for a maximum of six credits. Prerequisite: instructor's consent.

RUSSIAN

203—Advanced Russian Reading (3). Prerequisite: 3 or equivalent, or instructor's consent.

206—Conversation and Composition (3). Further develops oral command of Russian as well as listening comprehension and some letter writing skills. Prerequisites: 106 and 203, or instructor's consent.

251—Russian Literature of the First Half of the Nineteenth Century (3). Surveys Russian prose of the first half of the 19th century in translation. Analyzes works by Pushkin, Lermontov, Gogol and Turgenev. Prerequisite: sophomore standing or instructor's consent.

252—Tolstoy and Dostoevsky (3). Analyzes major works of Tolstoy and Dostoevsky. Readings and lectures in English. Prerequisite: sophomore standing.

253—Russian Modernism (3). Reads and analyzes selected works from Russia's modernist period, 1895-1930, including works by such authors as Chekhov, Mayakovsky, Pasternak, Babel, Zamiatin and Olesha. Readings and lectures in English. Prerequisite: sophomore standing.

254—Contemporary Russian Literature (3). Surveys Russian literature from 1930 to present. Analyzes works by such authors as Nabokov, Pasternak, Bulgakov and Solzhenitsyn. Readings and lectures in English. Prerequisite: sophomore standing.

275—Russian Classics I (3). Reading and discussion of selected works by major Russian writers of the 19th century. Course conducted in Russian. May be taken after 276. Prerequisite: 203.

276—Russian Classics II (3). Reading and discussion of selected works by major Russian writers of the 20th century. Course conducted in Russian. May be taken after 275. Prerequisite: 203.

301—Topics in Russian (cr. arr.). 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.

311—The Russian Novel (3). Selected readings and discussions of Russian masterpieces of the 19th and 20th century. Prerequisite: at least one of the 200-level Russian literature courses.

315—Russian Poetry (3). Survey of readings in Russian poetry from its beginnings to present. Prerequisite: 203 or equivalent.

316—Russian Drama (3). Selected readings in and discussions of major Russian plays of the 19th century. Prerequisite: 203 or equivalent.

350—Special Readings (1-3). Prerequisites: junior standing and chairman's consent.

Gerontology

202 Clark Hall (314)882-6011

A graduate interdisciplinary minor is available for both master's and PhD degrees.

For information concerning curriculum offerings and participating faculty write the Center for Aging Studies, 202 Clark Hall, Columbia, Mo. 65211, or call (314)882-6011.

Health and Physical Education

College of Education
20 Rothwell Gymnasium (314)882-7601

FACULTY

Ralph E. Stewart, chairman, professor, EdD, University of Missouri-Columbia

John A. Roberts, director of graduate studies, professor, PhD, University of Iowa

Leon Johnson, professor, EdD, University of West Virginia

Tom R. Thomas, professor, PhD, University of Missouri-Columbia

James D. Brown, associate professor, PhD, University of Illinois

Benjamin R. Londeree, associate professor, EdD, University of Toledo

Alex C. Waigandt, associate professor, PhD, University of Oregon

Maureen Fitzgerald, assistant professor, PhD, The Ohio State University

Sherry Folsom-Meek, assistant professor, PhD, Texas Women's University

Marilee Howell, assistant professor, MEd, University of Missouri-Columbia

Parris R. Watts, assistant professor, HSD, University of Indiana

DEGREES: MA, MEd or MAPE in health and physical education with the following emphasis areas: adapted physical education, administration of health and physical education, elementary school health and physical education, health education, human performance or secondary school health and physical education; EdD or PhD in health and physical education with the following emphasis areas: adapted physical education, administration of health and physical education, biomechanics, exercise physiology, health education or human performance

The Department of Health and Physical Education offers a variety of programs in areas of specialization at each graduate degree level. These programs are offered within the framework of each degree's requirements and are designed to provide flexibility according to the needs and interests of the individual candidate. These programs prepare graduates to teach health education or physical education at elementary, secondary or higher levels of education, to perform and direct research in public and private institutions, to administer programs in physical education and athletics and to administer physical fitness programs in industry or within private and community agencies.

See **Education** for general information.

Additional information may be obtained from the Director of Graduate Studies, Department of Health and Physical Education, 113 McKee Gym, Columbia, Mo. 65211.

COURSES

H201—Prevention and Care of Athletic Injury (2).

H204—Coach of Baseball and Softball (2).

H205—Coaching of Basketball (2).

H206—Coaching of Football (2).

H207—Coaching of Track and Field (2).

H227—Physical Education Activities for the Elementary School (2).

H240—Field Experience in Health and Physical Education (1-8). Supervised experienced in an approved setting. Approval based on the student's degree objective and adviser's consent.

H270—Teaching of Health (3).

H271—Techniques of Gymnastics (2). Skill refinement, methods and materials for tumbling and apparatus. Prerequisite: junior standing.

H272—Techniques of Individual and Dual Sports (2). Skill refinement, methods and materials for individual and dual sports. Prerequisite: junior standing.

H273—Techniques of Team Sports (2). Skill refinement, methods and materials for team sports.

H275—Teaching of Physical Education (2). Discussion and development of teaching competencies in the field of physical education.

H279—Organization and Administration of Physical Education Programs (2).

H299—Student Teaching in Health or Physical Education (cr. arr.). Credit arranged with director of educational field experience. Apply during February for the following year. Prerequisites: special methods course(s) in the elementary area or Curriculum and Instruction T240 and special methods course(s) in the secondary area.

H300—Problems (1-3). Studies professional programs and issues in health or physical education. Prerequisite: instructor's consent.

H320—Administration of Interschool Athletics (3). Organization, management of interscholastic, intercollegiate athletics.

H321—Health Education in the Elementary School (3). Defines teacher's role in school-health program, investigates health needs of school children, and focuses on teaching strategies, health resources and development of elementary school-health education curricula and materials.

H326—Motor Development in Early Childhood (3). Introduction to theory and practice of developmental movement, perceptual-motor assessment and remediation and teaching of movement experiences in early-childhood education for those planning teaching or other work with preschool through primary grade children. Prerequisite: Educational and Counseling Psychology A102.

H327—Elementary School Physical Education (3). Current theory and practice in physical education for the elementary school child. Programs and supervision of elementary school physical education philosophy, methods, materials and problems. Prerequisites: H65, H124, Educational and Counseling Psychology A102 or instructor's consent.

H360—Topics in Health and Physical Education (1-3). Social, medical and legal aspects of current issues in health and physical education, with special emphasis on the role of the teacher in relation to these issues.

H361—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: H65 or equivalent.

H365—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.

H366—Intramural Sports (2). Consideration of objectives and principles of administration in intramural sports in high schools and colleges.

H380—Kinesiology (3). Joint, muscular mechanisms of body and relationships of muscular activity to bodily development and efficiency. Prerequisite: Anatomy 201.

H381—Theory and Practice of Remedial Gymnastics (2). Analysis of postural problems, application of corrective measures. Prerequisites: H380, Anatomy 201 and Physiology 201.

H382—Adapted Physical Education (2-3). Principles and practice of physical education, recreation and motor therapy for the exceptional child and adult. Prerequisites: Educational and Counseling Psychology A102, Anatomy 201 or Physiology 201, or instructor's consent.

H383—Developmental Physical Activity (3). Role and application of motor activities in the physical and educational development of children and youth. Prerequisites: Educational and Counseling Psychology A102, Anatomy 201 or Physiology 201, or instructor's consent.

H385—Physiology of Exercise (3). Effects of exercise on the human organism, physiologic capacity and limitation for activity and the role of exercise in health and fitness. Prerequisites: Anatomy 201 and Physiology 201.

H391—Organization and Administration of Health Education Programs (3). Study of health models for health promotion, disease prevention and health education. Competencies developed in needs assessment, behavior change, planning and evaluation in health education programs.

H396—Drug Education (3). The psychosocial, legal and pharmacological aspects of the recreational use of over-the-counter and street drugs are investigated, with emphasis on personal decision making, principles of school and community drug education, and rehabilitation and community health services.

H400—Problems (1-6).

H407—Tests and Measurements in Health and Physical Education (3). Study of techniques used in measurement for evaluation by health and physical educators. Emphasis on computer applications for measurement, reliability and validity of measurement tools and determining standards for evaluation.

H409—Administration of Physical Education (3). Problems of administrators, supervisors, finances, construction, equipment, care of physical education plant and selection of staff. Prerequisites: H119 and H199.

H410—Seminar in Health and Physical Education (1-3).

H440—Scientific Studies in Health and Physical Education (3). Critical evaluation of methods of research in health and physical education. Course requires production of a research prospectus.

H444—Professional Literature in Health and Physical Education (3). Study and analysis of selected professional literature in health and physical education and in physiology, psychology and sociology, bearing directly on health and physical education.

H450—Individual Research (1-3). Independent research not leading to thesis. Prerequisites: H407 and H440.

H480—Mechanical Analysis of Motor Skills (3). Application of fundamental physical and mechanical principles to the performance of motor activities. Prerequisites: H380 and Physics 123 or equivalent.

H482—Practicum in Adapted Physical Education (2-6).

H484—Cardiovascular Health and Fitness (3). Physiology underlying best methods for obtaining and maintaining cardiovascular health and fitness.

H485—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 and some chemistry suggested.

H490—Research in Physical Education (cr. arr.).

Health Related Professions

School of Health Related Professions
206 Clark Hall (314)882-8011

COURSES

221—Clinical Methods II (3). Investigation of language and fluency disorders with particular attention to assessment procedures, intervention goals, and clinical management techniques. Prerequisite: 220.

225—Special Readings (1-3). Directed study of literature and research reports in the health-related professions. Prerequisite: instructor's consent.

300—Problems (cr. arr.). Prerequisite: instructor's consent.

301—Topics (1-3). Organized study of selected topics. Subjects will vary from semester to semester.

Health Services Management

School of Medicine
324 Clark Hall (314)882-6178

FACULTY

Gordon D. Brown, chairman, professor, PhD, University of Iowa

James A. Irvin, director of graduate studies, associate professor, PhD, University of Missouri-Columbia

Warren A. Thompson, professor, PhD, University of Missouri-Columbia

David A. West, professor, PhD, University of Arkansas

Keith E. Boles, associate professor, PhD, University of Arizona

John K. Glenn, associate professor, PhD, University of Missouri-Columbia

Lanis L. Hicks, associate professor, PhD, University of Missouri-Columbia

Kenneth D. Bopp, assistant professor, PhD, University of Missouri-Columbia

Harry Feirman, adjunct professor, PhD, Pennsylvania State University

Steven T. Fleming, assistant professor, PhD, University of Michigan

Paul P. Guptill, adjunct professor, MA, University of Iowa, MBA, University of Missouri-Columbia

D. Patrick Morton, assistant professor, MPA, University of Colorado

Gerald M. Sill, adjunct professor, JD, University of Missouri-Columbia

Robert B. Smith, adjunct professor, MBA, California State University

Michael B. Wood, adjunct professor, MPA, University of Missouri-Kansas City

DEGREES: MHA

DUAL DEGREES: MBA and MHA, MPA and MHA, MS in industrial engineering and MHA

The goal of the graduate program in health services management is to prepare professionals for leadership roles in health administration. Students can elect a concentration in managed health care systems, health planning and marketing, health services financial management, multi-institutional health corporations, ambulatory care administration, long-term care administration, mental health care administration, international development or hospital administration.

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).

MASTER'S DEGREE: The basic 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 a number of 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 management and health-system organization and development.

By combining basic and advanced course work with an internship and external management study (an applied management study that takes the place of a thesis), the student may develop an area of expertise in one of the concentration areas. 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.

DEGREE REQUIREMENTS: The MHA curriculum includes 15 hours of foundation course work, 45 hours of health services managment course work, and six hours of professional electives, which can be completed on a full- or part-time basis. To graduate, a student must maintain a GPA of 3.0 (A=4.0) or better.

The foundation courses are:

- Accounting Principles (Acctg 316)
- Managerial Finance (Bus Admin 344)
- Microeconomics for Managers (Econ 232)
- Organization Theory and Behavior (Bus Admin 301)
- Statistical Analysis (Stat 302 or 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 three-month summer internship under the guidance of a qualified preceptor in an approved health-care organization. This permits 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 course work. Clinical and field experience facilities are provided by health care organizations throughout the country. During the summer 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 environment.

After the second year, the student may elect to serve an administrative residency/fellowship of six months to one year. Students often choose a residency/fellowship to gain experience and broaden their orientation in large complex health institutions. If students lack previous work experience and desire an extended learning opportunity under a preceptor, they may elect, or the faculty may recommend, that a fellowship be served.

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 any subsequent graduate course work, and have achieved acceptable scores on the GRE general test (verbal and quantitative scores should total 1,000 or more) or the GMAT (above 50th percentile). Students who wish to dual 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 are available by writing the Admissions Coordinator, Graduate Program in Health Services Management, 324 Clark Hall, Columbia, Mo. 65211, (314)882-8413 or 882-6178.

COURSES

201—Topics in Health Services Management (1-3). Organized study of selected health services management topics for undergraduates and non-health services management graduate students. Subjects vary from semester to semester. Prerequisite: departmental consent for repetition.

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.

300—Problems (1-3). Directed exploration of health services management problems. Prerequisite: instructor's consent.

310—The Health Care System (3). Overview of the 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.

330—Risk Management System in a Health Care Institution (3). Course provides the student with an understanding of the basic functions and components of a risk-management system. Prerequisite: instructor's consent.

360—Management of Health Care Organizations (3). An integrative course that 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 and 215 or Management 202.

376—Computers and Health Services Applications (3). Examines administrative, clinical and research applications of the computer in health services' delivery. Prerequisites: Computer Science 104 or 201, or instructor's consent.

400—Problems (1-3). Intensive study of an area of health services management. Prerequisites: graduate standing and instructor's consent.

401—Topics in Health Services Management (3). Organized study of selected topics. Subjects will vary from semester to semester. Prerequisite: departmental consent for repetition.

410—Design of Health and Human Service (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. Prerequisites: 310 or instructor's consent.

424—Public Health and Medical Care Economics (3) (same as Economics 424). Demand and supply dynamics in public health and medical care. Prerequisites: 310 and Economics 232 or instructor's consent.

442—Labor Relations in the Health Industry (3). To identify role of organized labor in the health industry in its efforts to represent employees. Review history and legal status under appropriate federal and state law. Prerequisites: graduate standing and instructor's consent.

450—Methods and Research in Health Services (1-99). Principles and techniques of empirical analysis applied to the evaluation of health services programs. Content in methods includes formulating questions, design, sampling, measurement, data collections and statistical analysis. Requires consent of department.

460—Administration of Health Care Organizations (3). Analyzes health care organizations, emphasizing management structure, board of trustees and medical staff. Attention focused on delivery of institutional patient care, role of professionals and departmental interrelatedness. Prerequisites: 310, Business Administration 301 or instructor's consent.

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: 310, 460 and Business Administration 301.

470—Strategic Planning and Marketing for Health Care Organizations (3). Analysis of strategic planning and service management and marketing concepts, techniques and tools in the health-care industry. Includes analyzing the environment, assessing the organization's strenghts and weaknesses, formulating strategy to achieve competitive advantage and implementing strategy though service management and marketing.

471—Application of Management Science to the Health Care System (3). Applies principles/techniques of computer-based management science (systems theory, operations research) to complex health-care system problems. Prerequisites: 460, Statistics 207 or 302, or instructor's consent.

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.

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 operational 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. Prerequisite: 310 or instructor's consent.

475—Contemporary Issues in Health Care Policy (3). The historical development of contemporary issues in health-care policy are critically analyzed in a seminar format. Prerequisites: 310, 424, or instructor's consent.

476—Health Facilities Program Planning Design and Evaluation (3). An advanced investigation of organizing for hospital planning, approaches to the planning process, architecture and engineering for health facilities, institutional construction, and financial and legal requirements. Prerequisite: instructor's consent.

489—Field Experience in Health Services Management (cr. arr.). Supervised field experience in approved health agencies and institutions. Opportunity for observation and service participation in various fields of health. Prerequisites: graduate standing and instructor's consent.

Higher and Adult Education and Foundations

College of Education
301 Hill Hall (314)882-8231

FACULTY

Robert J. Dollar, chairman, professor, EdD, Oklahoma State University

Carolyn A. Dorsey, director of graduate studies, associate professor, PhD, New York University

John W. Alspaugh, professor, EdD, University of Missouri-Columbia

Irvin W. Cockriel, professor, EdD, University of Missouri-Columbia

Christopher J. Lucas, professor, PhD, The Ohio State University

John Christopher Reid, professor, PhD, University of Missouri-Columbia

Joseph L. Saupe, professor, EdD, University of Illinois-Urbana

Charles D. Schmitz, professor, PhD, University of Missouri-Columbia

Nicholas A. Adams, associate professor, EdD, American University, Washington, D.C.

Lonnie Echternacht, associate professor, EdD, University of Missouri-Columbia

Gary C. Fox, associate professor, PhD, Michigan State University

Steven W. Graham, assistant professor, PhD, University of Iowa

Julie A. Hughes, assistant professor, PhD, University of Iowa

Peggy Placier, assistant professor, PhD, University of Arizona

Bonnie Zelenak, assistant professor, PhD, Kansas State University

DEGREES: MA in higher and adult education, with emphasis areas in adult education, or higher education; EdSp in higher and adult education, with emphasis areas in adult education, or higher education; PhD in higher and adult education, with an emphasis area in higher and adult education; MA or PhD in social and philosophical foundations, with the following emphasis areas: educational policies and studies or history and philosophy of education.

These graduate programs lead to careers in community college education, adult education, teaching and research (including the historical and cultural foundations of education) and several other areas of higher education and administration.

Providing courses for graduate and undergraduate students majoring in a variety of departments across the campus is a commitment of the department. Graduate students preparing to teach their discipline in a college or university setting often complete a support area of 12 semester hours in courses concerning college teaching, college administration and the history and philosophy of higher education.

See **Education** for general information.

Additional information may be obtained from the Director of Graduate Studies, Department of Higher and Adult Education and Foundations, 301 Hill Hall, Columbia, Mo. 65211.

COURSES

EDUCATION STUDIES

B350—Historical Foundations of Modern Education (2-3). Educational practices and theory from ancient times to present.

B351—Historical Foundations of American Education (2.5-3). Development of American educational institutions and ideas, and of social forces which have influenced them. Prerequisite: course in American history.

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.

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, and higher education and the economy. Prerequisite: Sociology 1 or equivalent.

B360—Topics in Educational Studies (cr. arr.). Group or independent study of selected topics in the social and philosophic foundations of education. Prerequisite: instructor's consent.

B361—Studies of English Schools (3). Supervised field experiences in English schools: infant, junior, grammar, modern, technical and comprehensive schools, colleges of education, and universities. Prerequisites: junior standing and departmental consent.

B362—Studies of European Schools (2-4). Study of European Schools of many types, with visits planned in cooperation with respective ministries of education and supplemented by lectures and readings. Prerequisites: junior standing and departmental consent.

B363—Semester Abroad Seminar (2-4). Study in an academic subject (usually a branch of English literature or social science), supplemented by papers and discussions in tutorial groups. Prerequisites: junior standing and departmental consent.

B350—American Schooling in its Social Contexts (3). Multidisciplinary interpretation and critical analysis of the historical, philosophic, social and policial development of contemporary American education, including institutional structures, organizational patterns, multicultural perspectives, policies and practices. Prerequisite: junior standing or above.

B351—Historical Foundations of American Education (3). Development of American educational institutions and ideas, and of social forces that have influenced them. Prerequisite: junior standing or above.

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. Prerequisite: junior standing or above.

B400—Problems (cr. arr.). 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, focusing upon issues related to educational planning, education and modernization, Third World development, adult illiteracy, dilemmas of international 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). Historical approach to main issues confronting higher education in the United States.

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 (cr. arr.).

EDUCATIONAL RESEARCH AND STATISTICS

R312—Programming in LOGO and its Instructional Applications (2). The LOGO language and its use of turtle geometry. The psychological and curriculum issues associated with instruction in LOGO. Prerequisite: R101 or equivalent.

R314—Utility Software for Microcomputers (2). An introduction to the three major types of microcomputer utility programs: word processors, spreadsheet calculators and data base managers. Prerequisite: R101 or equivalent.

R316—Utilization of Instructional Software for Microcomputers (2). Selection and evaluation of microcomputer course ware. Curriculum issues and teaching strategies associated with computer assisted instruction. Prerequisite: R101 or equivalent.

R320—Microcomputer Software Development in BASIC (3). Development of BASIC language programs for microcomputers. Emphasis will be upon the more advanced concepts, including arrays, sequential and random access files, sound and graphics. Prerequisites: three semester hours of computing experience.

R330—Development of Instructional Software for Microcomputers in PILOT (3). PILOT authoring language and its use in developing computer assisted instructional software. Prerequisite: R316.

R340—Microcomputer Software Development in Pascal (3). Use of the UCSD P-system and program development in Pascal. Prerequisite: three semester hours of course work in either BASIC, FORTRAN, COBOL or PL/1.

R370—Educational Statistics I (3). Introduces statistical techniques employed in education, including descriptive statistics, correlation, simple regression and hypothesis testing.

R400—Problems in Educational Research and Statistics (cr. arr.).

R409—Overview of Educational Research (2). Design and interpretation of educational research, and methods of gathering and evaluating data. For master's and specialist's candidates. Doctoral students should take R441 instead of R409. Prerequisite: R370 or equivalent.

R410—Seminar in Educational Research and Statistics (1-3).

R435—Educational Statistics II (3). Analysis of variance and design of experiments for educational research. Prerequisite: a grade of B or higher in R370 or its equivalent.

R438—Computer Applications in Educational Research (3). Principles and techniques of utilization of computing as a tool in educational research. Prerequisites: R370 and R435 or R435 concurrently.

R441—Foundations of Educational Research (3). Principles and techniques of research problems, formulation of hypotheses, selection of appropriate design, and instrumentation and analyses. For doctoral students. Prerequisites: R370 and R435.

HIGHER AND ADULT EDUCATION

K260—Topics in Higher and Adult Education (cr. arr.). Lectures, discussions and field experiences of special interest to students enrolled in all undergraduate divisions, not a professional course for preparation of college teachers. May be repeated for credit. S/U graded only.

K301—Foundations of Adult Education (3). Provides a conceptual and historical base for the field of adult education from three broad perspectives, a social movement, field of operations and a field of study. Philosophical foundations of adult education also are introduced.

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.

K377—Women and Blacks in Higher Education (3). Historical survey of women and blacks in higher education in the United States, a comparative study of the forces that generated change, affirmative results and the backlash.

K400—Problems in Higher Education (cr. arr.). Prerequisite: departmental consent.

K410—Seminar in Higher Education (cr. arr.).

K411—Seminar in Adult 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—Organization and Administration of Adult Education (3). An examination of organizational behavior and the principles of administration in the context of adult and continuing education. Emphasis on the issues of leadership, decision making, organizational culture, power and influence, budgets, marketing and implications for practice.

K440—Facilitating Learning in Adult Education (3). A study of the methodologies and techniques most appropriate for facilitating adult learning. Processes for the selection, development, use and evaluation of methods in a variety of adult education settings will be examined. Prerequisite: K415.

K441—Program Planning in Adult Education (3). A study of selected models for program planning in adult education. Individuals will gain experience in planning, developing, implementing and evaluating a program in an adult education setting. Prerequisite: K415.

K460—Topics in Higher and Adult Education (cr. arr.).

K462—Foundations of Student Affairs Administration (3) (same as Educational and Counseling Psychology A440).

K463—Student Affairs Administration Methods and 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.

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.

K475—College Administration (2-3). Considers problems of organization and administration in institutions of higher education.

K480—Internship in Higher Education (cr. arr.). Internship experience under supervision in institutions of higher education. Prerequisite: departmental consent.

K490—Research in Higher Education (cr. arr.). Prerequisite: departmental consent.

History

College of Arts and Science
101 Read Hall (314)882-2481

FACULTY

Russell Zguta, chairman, professor, PhD, Pennsylvania State University

Jonathan Sperber, director of graduate studies, associate professor, PhD, University of Chicago

Robert M. Collins, director of undergraduate studies, professor, PhD, Johns Hopkins University

Thomas B. Alexander, professor emeritus, PhD, Vanderbilt University

N. Gerald Barrier, Middlebush Professor, PhD, Duke University

Richard T. Bienvenu, professor, PhD, Harvard University

John L. Bullion, professor, PhD, University of Texas

Winfield J. Burggraaff, professor, PhD, University of New Mexico

Gerard H. Clarfield, professor, PhD, University of California-Berkeley

Noble E. Cunningham Jr., Curators Professor, PhD, Duke University

Susan Flader, professor, PhD, Stanford University

Claudia Kren, professor emeritus, PhD, University of Wisconsin
John E. Lankford, professor, PhD, University of Wisconsin
Kerby A. Miller, professor, PhD, University of California-Berkeley
Charles F. Mullett, professor emeritus, PhD, Columbia University
Charles G. Nauert Jr., professor, PhD, University of Illinois
Robert E. Ruigh, professor emeritus, PhD, Harvard University
Arvarh E. Strickland, professor, PhD, University of Illinois
Charles E. Timberlake, professor, PhD, University of Washington
Tani E. Barlow, associate professor, PhD, University of California-Davis
Susan Porter Benson, associate professor, PhD, Boston University
Alfred S. Bradford, associate professor, PhD, University of Chicago
David R. Roediger. associate professor, PhD, Northwestern University
A. Mark Smith, associate professor, PhD, University of Wisconsin-Madison
Steven A. Watts, associate professor, PhD, University of Missouri-Columbia
Eli Zaretsky, associate professor, PhD, University of Maryland
Jean M. Allman, assistant professor, PhD, Northwestern University
Theodore Koditschek, assistant professor, PhD, Princeton University
Lawrence Okamura, assistant professor, PhD, University of Michigan-Ann Arbor
Robert E. Weems Jr., assistant professor, PhD, University of Wisconsin
LeeAnn Whites, assistant professor, PhD, University of California-Irvine
Sundiata K. Cha-Jua, instructor

DEGREES: MA and PhD in history

Lecture courses, seminars and directed research are available in ancient, medieval and modern history from Europe, Russia, Great Britian, 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 also are 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 primary and secondary works dealing with Missouri history. The program in American history has available the resources of the Truman Library at Independence, Mo.

The computing facilities on campus are available to graduate students for suitable projects.

The department provides qualified students the opportunity to gain college-level teaching experience by conducting discussion sections in American and European history. They earn $6,240 an academic year and must carry 9 semester hours. Each appointment is subject to annual review and may be renewed up to a maximum of five years.

The Graduate School offers a number of fellowships and scholarships. Interested students should apply to the Associate Dean for Fellowships and Graduate Student Affairs, Graduate School, 210 Jesse Hall, Columbia, Mo. 65211. ***Fellowship and assistantship application forms and additional information concerning financial aid or degree programs may be obtained by writing the Director of Graduate Studies, 101 Read Hall, Columbia, Mo. 65211.***

Applications for financial aid should be filed no later than January 15, but will be accepted until appointment decisions are made. Announcements of awards are made April 1.

MASTER'S DEGREE: The Department of History requires all applicants for the MA to send to its Director of Graudate Studies a short essay (no more than 500 words) in which you explain your aims and expectations in graduate study. This personal statement should indicate the fields in which you plan to specialize, your professional and vocational goals, and other reasons for wishing to continue your study.

The Department also requires additional evidence which will assist us in judging your prospects for success in graduate work. To be considered for admission, students with the BA must normally have:

- GPA of 3.0 (on a 4.0 scale) over the last sixty 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 his/her work
- sample of written work from a course, in addition to the standard essay

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 students or unclassified graduate students. To be considered for admission to the graduate program, post-baccalaureate students must complete nine hours of history at the 300 and/or 400 level with a 3.3 GPA. Unclassified students must complete nine hours of history at the 300 and/or 400 level with a 3.3 GPA.

Early in the first term of residence at MU, the student is assigned an adviser who assists in planning an MA degree program. Students must be in residence at MU for a minimum of two semesters or three summer sessions. 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 non-resident 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 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.
- 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 masters 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 before the end of their second 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 and/or off the committee believe that this 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: Greece, Rome, Medieval, Renaissance and Reformation, Early Modern Europe, Britain before 1688, Britain from 1688, Modern Europe (1789-present), France, Germany (1789-present), Kievan Rus', Moscovite and Imperial Russia, Russia (Peter the Great to the present), European Intellectual History, History of Science, American Colonial and Revolutionary History (to 1787), the National Period (1787-1877), Recent United States (1877-present), the South, the West and Environmental History, Diplomatic History, Social History, Intellectual History, African-American History, Urban and Immigration History, India, Latin America, Africa and East Asia.

Before admittance to the comprehensive examination, a candidate must meet the language and other research technique requirements. Mastery of 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 examination by members of the department
- 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, a qualified member of the history faculty at MU. The final examination is oral and open to the public. 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 take history courses numbered 201-299 for graduate credit.

201—Topics (cr. arr.). 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 and 20th centuries. Relation between politics, economics, technological change, environmental quality, roles of science, law, regulatory agencies and 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.

205—The Greek World (3). Political and social institutions and intellectual life of Greek city-states to time of Alexander.

206—The Roman World (3). Rise and development of Roman institutions and Rome's imperialism and culture through reign of Marcus Aurelius.

207—History of Sparta (3). Study of a unique society. Spartans lived under military discipline from the age of six to 60. Emphasis is placed on the early organization of Sparta, the wars of the fifth century and the use that philosophers made of the Spartan systems.

208—The Golden Age of Athens (3). Study of Athenian democratic institutions from Solon to 404 B.C.

209—Alexander the Great and the Hellenistic World (3). Alexander's conquest of the East to 323 B.C. and the political, social and 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.

215—Social History of American Women (3) (same as Women Studies 215). Social history of American women in the contexts of family, work, religion, education and politics. Focus on gender, class, race, ethnicity, age and region.

217—History of Religion in America to the Civil War (3). Studies major American religious traditions from the Age of Discovery to the Civil War, especially the evolution of religious beliefs and institutions and their influence upon American social, intellectual and political developments.

218—History of Religion in Post-Civil War America (3). Surveys major American religious traditions from 1865 to the present. Focuses on the evolution of religious beliefs and institutions, and their interaction with and influence upon American social, intellectual and political developments.

221—Europe in the Nineteenth Century (3). Political, social, economic and cultural development of Europe from French Revolution to the outbreak of World War I.

230—European Women's History (3) (same as Women Studies 230). An examination of European women's experiences and activities and the impact of economic, political and social changes of the 19th and 20th centuries.

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, Marcus Garvey, M. L. King Jr. and Malcolm X.

236—Black Islam (3). A historical survey of the origins, development and impact of the African-American Islamic tradition.

237—Women in African History (3). Focuses on the varied and changing roles of women in sub-Saharan Africa from precolonial times to the present.

240—The 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.

241—Imperial China (3) (same as Peace Studies 141). A survey of China under the Manchu Ch'ing dynasty. Within framework of the dynastic cycle, examines imperial rule, Chinese society, culture, art, internal rebellion, Western intrusion and modernization.

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.

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.

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 non-violent tradition in America, Europe and the Third World.

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 1960s (3). 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.

253—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.

255—History of the Family in America (3). The American family from the colonial period to the present, including its background in Europe and other societies. The focus is on family life and its connections to politics, economics and culture.

History

260—The Ancient Art of War (3). Study of the history of warfare from its origins to the fall of Rome.

265—Politics of American Science (3). Traces the development of American science policies from 1789 to present. Focuses on ways the federal government has stimulated scientific activities and has been a consumer of science.

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.

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.

282—History of British India (3) (same as South Asian Studies 282). Introduction to traditional India, the Muslim experience, European rivalry and British hegemony, and problems of Crown rule; social and political reforms in the making of modern India.

300—Special Problems (cr. arr.). Independent investigation leading to a paper or project.

301—Topics (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

307—The Roman Revolution (3). Analysis of the downfall of Republican institutions and the origins of autocracy, from the Gracchi to the death of Augustus in A.D. 14.

310—The Roman Empire (3). Roman imperialism, management of and rebellion in the Empire and the 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.

318—Medieval Culture (3) (same as Peace Studies 318). Explores selected themes of medieval culture, such as the evolution of scholastic thought, the development of the crusading ideal, science, technology and social change.

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.

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.

342—Age of Jefferson (3). Political, constitutional, cultural and economic developments in the United States during formative period of Republic, 1787-1828. Special attention to the Constitutional Convention and formation of national political institutions.

345—Modern Japan & China—A Comparative Survey (3). A structured, comparative examination of the histories and cultures of Japan and China, from the mid-19th century to the present. Orientation towards broad social, intellectual and political developments.

349—American Social History Since 1865 (3). Study of daily life and its relation to the transformation from an industrial to a service economy and from production to consumption. Focus on ordinary Americans' experiences of family, work, leisure and community, as they vary by class, region, race ethnicity, age and gender.

350—Special Readings (cr. arr.). 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, African-American and slaveholding 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, the rise of welfare state liberalism, socialist and feminist alternatives and literature and the arts.

353—American Urban History (3). Growth, development and significance of the city in American history and the historical analysis of urban problems.

356—Origins of Modern America, 1877-1919 (3). Political, social, economic and intellectual evolution of America into a modern society, 1877-1919.

357—Recent United States History 1919-1945 (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.

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, with rivalry between nationalizing and sectionalizing forces emphasized.

363—American Colonial History to 1760 (3). Study of colonial America, with special emphasis on creation of a native American culture before 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.

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, and economic, social and political upheaval.

370—American Foreign Policy from Colonial Times to 1898 (3) (same as Peace Studies 371). History of foreign policy from the pre-Revolutionary period to the Spanish-American War.

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.

373—The Age of Ascendency: U. S. Foreign Relations, 1945-present (3). Surveys the Cold War in Europe and Asia, the Korean and Vietnam Wars, and Middle East policy.

375—Historic Preservation (3) (same as Art History and Archaeology 375). "State of the art" survey of the historic preservation movement and techniques by MU 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.

391—Afro-Americans in the Twentieth Century (3). Survey of political, social, economic and intellectual development of the Negro in America since the 19th century.

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 (cr. arr.). Individual work not leading to dissertation. Prerequisite: instructor's consent.

401—Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credits may vary from semester to semester. May be repeated to a maximum of six hours.

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 and use of related techniques. Required of graduate students in history.

411—Readings in Russian History (3). Reading of 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 six 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.

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 six 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 six hours.

420—Independent Readings for History PhD Comprehensive Examination (cr. arr.). Independent readings for PhD comprehensives. Open only to graduate students formally admitted to candidacy for PhD in history.

421—Seminar in British History (3). Investigation of social and intellectual problems of modern Britain. May be repeated to a maximum of six hours.

423—Readings in English History (3). Readings in historical literature covering period since 1660 with particular reference to new interpretations of political and social developments. May be repeated to a maximum of six hours.

425—Seminar in Medieval Culture (3). Investigates cultural developments in the medieval period. May be repeated to a maximum of six 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 six 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 six 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 six 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 six hours.

432—Seminar in Modern European History (3). Investigation of problems of modern Europe. May be repeated to a maximum of six hours.

435—Readings in French History (3). Readings in selected problems in the history of France since 1789. May be repeated to a maximum of six hours. Reading knowledge of French required.

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 six 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 six hours.

438—Readings in Afro-American History (3). Readings on selected topics in Negro history from 1619 to the present, with emphasis on conflicting interpretations. May be repeated to a maximum of six hours.

439—Seminar in Afro-American History (3). Directed research in selected topics in African-American history. May be repeated to a maximum of six hours.

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 six 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, with class periods devoted to critical evaluation. May be repeated to a maximum of six 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 six hours.

444—Readings in American Urban History (3). Class meetings devoted to critical evaluation of writings in the field. May be repeated to a maximum of six 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 six 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 and work. May be repeated to a maximum of six hours.

449—Seminar in American Social History (3). Directed original research and writing in American social history. May be repeated to maximum of six hours.

450—Research (cr. arr.). 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 six hours.

453—Seminar in United States Sectionalism, Civil War and Reconstruction (3-12). Directed original research on political and related topics of the period 1848-1877. May be repeated to a maximum of six hours.

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 six 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 six hours.

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 six 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, 1877-1919. May be repeated to a maximum of six hours.

465—Readings in Recent United States History (3). Critical evaluation of writing in American history in period 1919 to present. May be repeated to a maximum of six 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 six 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 six 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 six 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 six 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 six hours.

490—Research (cr. arr.).

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 and Russian. May be repeated to a maximum of six hours.

Horticulture

College of Agriculture, Food and Natural Resources
1-40 Agriculture Building (314)882-7511

FACULTY

Ray R. Rothenberger, chairman, professor, PhD, University of Missouri-Columbia

John H. Dunn, director of graduate studies, professor, PhD, Rutgers University-New Brunswick

Ronald E. Taven, professor, MS, University of Minnesota-St. Paul

Arthur E. Gaus, professor emeritus, PhD, University of Missouri-Columbia

Delbert D. Hemphill, professor emeritus, PhD, University of Missouri-Columbia

Victor N. Lambeth, professor emeritus, PhD, University of Missouri-Columbia

Marlin N. Rogers, professor emeritus, PhD, Cornell University

Raymond A. Schroeder, professor emeritus, PhD, University of Missouri-Columbia

James E. Smith Jr., professor emeritus, MS, University of Illinois-Urbana

David D. Minner, associate professor, PhD, Colorado State University-Fort Collins

Leon C. Snyder Jr., associate professor, MLA, University of Michigan-Ann Arbor

Christopher J. Starbuck, associate professor, PhD, Oregon State University-Corvallis

David H. Trinklein, associate professor, PhD, University of Missouri-Columbia

Michele R. Warmund, associate professor, PhD, University of Missouri-Columbia

Milon George, adjunct associate professor, PhD, University of Minnesota-St. Paul

John M. Brown, assistant professor, PhD, North Carolina State University-Raleigh

Chad Finn, assistant professor, PhD, University of Minnesota

Dyremple Marsh, adjunct assistant professor, PhD, University of Minnesota-St. Paul

Lurline Marsh, adjunct assistant professor, PhD, University of Minnesota-St. Paul

Charles D. DeCourley, extension associate, MS, University of Missouri-Columbia

Barbara Fick, extension associate, MS, University of Minnesota

DEGREES: MS and PhD in horticulture

Graduate study in horticulture currently provides emphasis in stress mechanisms, water relations, physiological processes and breeding 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, as well as positions in extension and large horticultural or horticulturally related businesses.

Fellowships, scholarships and research assistantships may be available for qualified students seeking graduate education. ***For information on current availability, write the director of graduate studies in the department, 1-40 Agriculture Bldg, Columbia, Mo. 65211.***

MASTER'S DEGREE:

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 horticulture. 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 indicates 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 of 400-level courses. All graduate students are required to participate in all departmental educational activities like 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 additional 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 vocationally 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 past record and current interests, the committee may recommend acceptance or rejection based on past performance as well as 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

201—Ornamental Woody Plants I (3). Identifies and evaluates trees and coniferous evergreens for landscape use. Prerequisite: 30 or Biological Sciences 1, 12 or 21.

202—Ornamental Woody Plants II (3). Identifies and evaluates shrubs, vines and ground covers for landscape use. Prerequisite: 30 or Biological Sciences 1, 12 or 21.

203—Plant Propagation (3). Principles and practices of propagation of horticultural plants. Prerequisite: 30 or Biological Sciences 12.

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

206—Plant Protection (3). Control measures for diseases, insects, weeds and other pests of horticultural crops. Prerequisites: 30 or Biological Science 12 and Entomology 101 or instructor's consent.

207—Plant Origin and Development (3). Traces development of horticultural plants by civilization from centers of origin to present, continuing improvement by modern meth-

ods of plant breeding. Prerequisite: 30 or Biological Sciences 12.

209—Principles of Weed Management (4) (same as Agronomy 209 and Pest Management 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. Prerequisite: Agronomy 30 or Biological Science 12 or equivalent.

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

252—Planting Design I (3). The art and science of plant selection based on aesthetic and environmental determinants, functional and visual requirements and expected maintenance. Prerequisites: 201, 202 and 250.

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

257—Construction Materials (3). Physical and aesthetic properties of inanimate materials and structural designs commonly used to organize landscape spaces. Prerequisites: 250 and Mechanical and Aerospace Engineering 20.

266—Plant Forcing Structures (3). Practical investigation of historical development, architectural styles, location, structural parts, climate control, interior equipment and maintenance of structures used for the production of flower and vegetable crops.

300—Problems (cr. arr.). Independent specialized investigation into areas of horticultural interest. Prerequisite: consent required.

323—Diseases of Ornamentals and Turf (2) (same as Plant Pathology 323).

330—Fruit Production (5). Advanced study of fruit industry, emphasizing production, management of deciduous tree and small fruit enterprises. Prerequisites: 203, 204, 205, or instructor's consent.

344—Commercial Vegetable and Truck Crop Growing (5). Advanced study of commercial vegetable enterprises including growing areas, management, production problems and practices. Prerequisites: 204, 205, 206, or instructor's consent.

350—Landscape Graphics Communication (3). Experimentation with various techniques and media of graphics. Prerequisites: 254, 272 and instructor's consent.

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, 272 and instructor's consent.

355—Turf (3). Characteristics of turf materials and principles of establishment and maintenance. Prerequisites: 204 and 205 or instructor's consent.

356—Arboriculture (3). The establishment and cultivation of outdoor ornamental plants.

357—Nursery Crop Production and Management (4). Operations and methods used by wholesale, retail and landscape nurseries. Field problems, observational trips. Prerequisites: 203 and 204.

361—Fall Greenhouse Crops (4). Business management problems of a commercial greenhouse range and culture of commercial cut flowers and potted plant crops. Prerequisites: 203, 204 and 205 or instructor's consent.

362—Spring Greenhouse Crops (4). Continuation of 361. Production management problems and commercial culture of spring cut flowers and potted plants.

390—Horticulture Internship (1-8). Through practical work experience, under the direct supervision of an academic adviser and a horticulture business manager, a student develops and applies knowledge of horticulture. A student should consult an academic adviser for internship details. Prerequisites: junior standing, departmental consent. S/U graded only.

402—Topics in Horticulture (cr. arr.). Discusses highly specialized topics in the field of horticulture. Prerequisites: graduate standing and consent card.

406—Plant Growth Regulating Substances (3). Chemistry, physiology and practical applications of plant growth regulating substances in development of plants. Prerequisites: Biological Sciences 313 and six hours of organic chemistry.

407—Breeding of Horticultural Plants (cr. arr.). Literature and original investigations on breeding and selection of horticultural plants. Prerequisites: graduate standing, Agronomy 179 or Biological Sciences 202, 341 and instructor's consent.

410—Seminar (1). Recent investigations in horticulture and related fields.

444—Advanced Olericulture (3). Physiological factors affecting growth, harvesting and storage of vegetable crops. Survey of fundamental literature. Prerequisites: graduate standing, 344 and 345.

450—Non-Thesis Research (cr. arr.). Prerequisite: instructor's consent.

490—Research (cr. arr.). Prerequisite: departmental consent.

Human Development and Family Studies

College of Human Environmental Sciences
31 Stanley Hall (314)882-4035

FACULTY

Marilyn Coleman, chairwoman, professor, EdD, University of Missouri-Columbia

Lawrence Ganong, professor, PhD, University of Missouri-Columbia

Kathy Thornburg, professor, PhD, University of Missouri-Columbia

Mary Gray, associate professor, PhD, Michigan State University

Jean Ispa, associate professor, PhD, Cornell University

Lois Bryant, assistant professor, PhD, University of Missouri-Columbia

Ann Deaton, assistant professor, PhD, Virginia Polytechnic Institute and State University

Mary Deluccie, assistant professor, PhD, Kansas State University

Johnetta Morrison, assistant professor, EdD, Syracuse University

Marion Typpo, assistant professor, PhD, University of Missouri-Columbia

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) and the master of science (research emphasis) degrees may specialize in family studies, medical child development, early childhood, life span human development or administration of human services. Programs are structured to provide students with an integration of empirical research training, practical experiences and broad theoretical interpretation.

The MA and MS degrees prepare students for positions in junior college or college teaching, in adult education programs (such as extension), in the administration of human service programs, or leadership in both public and private 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 institutions.

See **Human Environmental Sciences** for general information.

Additional information may be obtained from the Director of Graduate Studies, Department of Human Development and Family Studies, 31 Stanley Hall, Columbia, Mo. 65211.

COURSES

225—Introduction to the Study of Families (3). Examination of how families function. Diversity of families, crucial life choices and resource utilization. Eco-system analysis of family issues such as wellness, self-reliance and strength.

250—Early and Middle Childhood (3). Emotional, cognitive and physical development of the child before puberty. Observation is integral part of course.

251—Adolescence and Young Adulthood (3). Physical, intellectual and psychosocial maturation of adolescents and young adults within the context of lifelong developmental sequelae. Prerequisite: three semester hours of behavioral science.

262—Infant-Toddler Development and Programs (3). Applied cognitive, language and social development of infants and toddlers. Emphasizes supporting development in a child-care setting and staff relations. Prerequisite: 250 or equivalent.

263—Curriculum and Activities for the Early Childhood Setting (3). Development of curriculum for children birth through 5 in preschool settings. The development of program activities for children birth through 5 and 6 through 10 in afterschool care settings. Prerequisites: 250 and may be concurrent with 262.

264—Child Development Laboratory (2-5). Experience in working with young children (2-5 years), adult-child relationships, general guidance principles, and techniques and methods of fostering curiosity and creativity. Prerequisites: 160 or equivalent and instructor's consent.

300—Problems in Child and Family Development (cr. arr.). Independent work on special problems in child and family development. Prerequisite: instructor's consent.

318—Topics (cr. arr.). Selected current topics in field of interest.

330—Child Nutrition (3) (same as Human Nutrition, Foods and Food Systems Management 330).

341—Multicultural Study of Children and Families (3). Study of multicultural (such as Afro-American, Hispanic, native American) groups within context of their cultural heritage. Attention given to interaction with institutions of dominant society. Prerequisite: junior/senior standing.

350—Readings (cr. arr.). Readings in recent research and critical discussions.

351—The Black Family Past, Present and 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: junior standing.

352—Violence in the Family (3). Focus is on causes and correlates of child abuse and neglect as well as violence between spouses, siblings and intergenerational family members. Prerequisites: six hours of human development and family studies/psychology/sociology/social work.

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 and Families (2-3). Includes design, operation and evaluation of programs. Field experience included. Prerequisite: 264 or instructor's consent.

360—Community Programs for Children and Families (3). Study of group organization and dynamics, combined with experience in community programs.

361—Working With Parents (2-3). Understanding of parents and their perspectives, interpersonal communication and relationships, conference and group meeting techniques. Includes experience with parent groups.

363—Family Development (3). Analysis of the developmental stages of the family life cycle from establishment through aging.

364—Advanced Child Development Laboratory (8). Work

with young children (2-5 years) includes developing early-childhood programs and manipulative, representational, language and discovery experiences for young children; stud and of program models. (Consult instructor to schedule lab hours.) Prerequisites: 264 or equivalent and instructor's consent.

367—Adulthood and Aging (3). Focus is on those factors in the family environment (nutrition, housing, finances) that have impact upon the physical, social and psychological well-being during the last half of lifespan development. Prerequisite: 150 or instructor's consent.

368—Family Interaction (3). Analysis of intrafamilial interaction from a systems perspective; includes comparative study of family paradigms, family subsystems, goals and resources, boundaries, and patterns of feedback. Prerequisite: six hours of behavioral science.

369—The Development of Sex-Role Behavior (2). Emphasis on development of sex-role behaviors. Considers alternative theories of identification and the influence of biological, familial and cultural variables. Prerequisite: six hours of human development and family studies or instructor's consent.

373—Dynamics of Marriage and Divorce (3). Examination of theory and research related to marital functioning and dissolution. The impact of marital quality and divorce on children will be considered. Prerequisites: 163 and 225, or instructor's consent.

374—Play Techniques with Individual Children (3). The study and practice of play as an educational, evaluative and therapeutic intervention with children. Supervised play sessions with individual child. Prerequisites: 264, equivalent experience 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: six hours in social/behavioral sciences.

390—Field Training (cr. arr.). Prerequisite: instructor's consent.

400—Problems (cr. arr.). Prerequisite: instructor's consent.

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.

405—Integration and Application of Human Development Principles (3). Emphasizes life span theory, research and curriculum planning with applied experience in the application of human development principles in small groups. Prerequisites: six hours of 300-level courses and instructor's consent.

412—Family Dynamics and Intervention (3) (same as Nursing 412). Theories of family function and dysfunction; techniques of assessment and models of family intervention. Practicum with selected families.

415—Readings (cr. arr.). Readings in recent research and critical evaluation. Prerequisites: graduate standing and instructor's consent.

418—Topics (cr. arr.). Selected current topics in field of interest.

419—Field Training (cr. arr.). Internships or field experiences under supervision. Prerequisites: graduate standing and instructor's consent.

425—Remarriage and 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: six hours of 300-level courses and instructor's consent.

450—Research (cr. arr.). Independent research not leading to a thesis. Report required.

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: six hours of 300-level behavioral sciences courses or instructor's consent.

469—Family Theories and Measurement (3). Considers the deductive and inductive application of selected behavioral theories and research to the study of families. Includes measurement of variables, theory building and theoretical diagramming. Prerequisite: graduate standing or instructor's consent.

470—Stress and Crises in Families (3). The study of the influence of stressor events on family functioning. Emphasis on those variables which tend to increase or decrease the probability of family crisis. Prerequisite: 368 or instructor's consent.

490—Research (cr. arr.). Independent research leading to thesis or dissertation.

Human Environmental Sciences

College of Human Environmental Sciences
(314)882-7014

FACULTY

Beatrice B. Smith, dean, professor, PhD, University of Minnesota

CONSUMER AND FAMILY ECONOMICS

Edward J. Metzen, chairman, professor, EdD, University of Missouri-Columbia
Eunice Lieurance, associate professor, MS, Michigan State University
Robert O. Weagley, associate professor, PhD, Cornell University
Melchior J. Zelenak, associate professor, PhD, University of Iowa
Craig L. Israelson, assistant professor, PhD, Brigham Young University
Michele Merfeld, assistant professor, PhD, Oregon State University
Barbara J. Slusher, assistant professor, PhD, University of Missouri-Columbia

ENVIRONMENTAL DESIGN

Ruth Brent, chairwoman, associate professor, PhD, University of Minnesota
Richard Helmick, professor, MFA, The Ohio State University
Gary L. Hennigh, associate professor, MFA, University of Colorado
Martha Folk, assistant professor, MLA, University of Michigan
Pat Hilderbrand, assistant professor, MA, University of Missouri-Columbia
Ronald Phillips, assistant professor, ArchD, University of Michigan
Sandra Rawls, assistant professor, PhD, Virginia Polytechnic Institute and State University
John Pruitt, instructor, MArch, Washington University
Howard Marshall, adjunct associate professor, PhD, Indiana University

HUMAN DEVELOPMENT AND FAMILY STUDIES

Marilyn Coleman, chairwoman, professor, EdD, University of Missouri-Columbia
Larry Ganong, professor, PhD, University of Missouri-Columbia
Kathy Thornburg, professor, PhD, University of Missouri-Columbia
Mary Gray, associate professor, PhD, Michigan State University
Jean Ispa, associate professor, PhD, Cornell University
Lois Bryant, assistant professor, PhD, University of Missouri-Columbia
Anne Deaton, assistant professor, PhD, Virginia Polytechnic Institute and State University
Mary DeLuccie, assistant professor, PhD, Kansas State University
Johnetta Morrison, assistant professor, PhD, Syracuse University
Marion Typpo, assistant professor, PhD, University of Missouri-Columbia

HUMAN ENVIRONMENTAL SCIENCES COMMUNICATIONS

Barbara Froke, associate professor, EdD, University of South Dakota

HUMAN NUTRITION AND FOODS

Richard Dowdy, chairman, associate professor, PhD, North Carolina State University
Laura Hillman, professor, MD, Yale University
Loretta Hoover, professor, PhD, University of Missouri-Columbia
Roger Sunde, professor and nutrition cluster leader, PhD, University of Wisconsin
Gretchen Hill, associate professor, PhD, Michigan State University
Karla Hughes, associate professor, PhD, University of Tennessee
Gabriella Molnar, associate professor, PhD, Vanderbilt University (Lincoln University)
James Nordstrom, associate professor, PhD, University of Minnesota (Lincoln University)
Gail Gates, assistant professor, PhD, Pennsylvania State University
Candace Holdt, assistant professor, PhD, University of Nebraska
Pearlly Yan, assistant professor, PhD, Iowa State University
Lucy Zahler, assistant professor, PhD, University of Wisconsin

SCHOOL OF SOCIAL WORK

Judith Davenport, director, associate professor, PhD, University of Wyoming
Judith Burke, associate professor, PhD, Bryn Mawr College
Joseph Davenport III, associate professor, PhD, University of Wyoming
Bettyann Dubansky, associate professor, MSW, Washington University
Michael Kelly, associate professor, PhD, University of Texas
Larry Kreuger, associate professor, PhD, St. Louis University
O. Duane Kroeker, associate professor, MSW, University of Pennsylvania
Marilyn Maddux, associate professor, MSW, Washington University
Joanne Mermelstein, associate professor, PhD, St. Louis University
Stephen Moore, associate professor, PhD, University of Kansas
Paul Sundet, associate professor, PhD, University of Illinois
Erma Ballenger, assistant professor, PhD, University of Nebraska
Wayne Busby, assistant professor, PhD, University of Oklahoma

TEXTILE AND APPAREL MANAGEMENT

Kitty Dickerson, chairwoman, professor, PhD, St. Louis

University

Nancy Fair, associate professor, PhD, North Carolina State University

Jean Hamilton, associate professor, PhD, University of Missouri-Columbia

Usha Chowdhary, assistant professor, PhD, The Ohio State University

Betty Dillard, assistant professor, PhD, University of Missouri-Columbia

Pamela Norum, assistant professor, PhD, Cornell University

Laurel Wilson, assistant professor, PhD, University of North Carolina-Greensboro

DEGREES: MA and MS in human environmental sciences communications, MSW in social work, MS in consumer and family economics; PhD in human environmental sciences, with an emphasis area in consumer and family economics; MA and MS in environmental design; PhD in human environmental sciences, with an emphasis area in environmental design; MA and MS in human development and family studies; PhD in human environmental sciences, with an emphasis area in human development and family studies; MS in human nutrition and foods; PhD in human environmental sciences, with an emphasis area in human nutrition, foods and food systems management; MA and MS in textile and apparel management; PhD in human environmental sciences, with an emphasis area in textile and apparel management.

The College of Human Environmental Sciences offers graduate study in various disciplines. Programs emphasize the interrelationships of human factors with the socio-economic 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, food, nutrition, food systems management, textile and apparel management, environmental design, consumer and family economics and human environmental sciences communications. Students with these master's degrees are in demand for positions in extension, government service, business, teaching and research. Master's degrees with emphasis in the listed areas of human environmental sciences also are offered through extension education in the College of Agriculture, Food and Natural Resources and through home economics education in the College of Education.

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. The PhD program in human environmental sciences is planned individually to focus upon a specific area: human development and family studies, textile and apparel management, consumer and family economics, environmental design, nutrition or food systems management.

Research facilities in Gwynn and Stanley Halls are available for graduate students. A social and behavioral sciences research area provides microcomputers and terminals for mainframe access for manuscript preparation and statistical analysis. Also available are nutrition laboratories for animal and human studies, 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, microcomputers and design equipment.

University Hospital and Clinics, the Experiment Station laboratories, the whole-body counter and the Research Reactor provide additional opportunities for study. Students in food and nutrition 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 College of Education, through the coordinator of home economics education, provides opportunities for certification of specialization in addition to subject-matter degrees. 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 at any time. Information also is available on national fellowships.

For application forms, write the Director of Graduate Studies, College of Human Environmental Sciences, 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, taking into account 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 an average grade of B.

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.

Human Environmental Sciences Communications

College of Human Environmental Sciences
117 Gwynn Hall (314)882-6424

FACULTY

Barb Froke, associate professor, EdD, University of South Dakota

DEGREES: MA and MS in human environmental sciences

The degrees prepare students for positions in communications — newspaper, radio, television, advertising, magazine and public relations — in which a background in human environmental sciences is helpful or essential. Courses may be selected from one of the five departments, or a combination of all five which include human development and family studies, textile and apparel management, consumer and family economics, environmental design and human nutrition and foods.

Positions may be found in business, government, educational institutions, not-for-profit agencies and the media.

See **Human Environmental Sciences** for general information.

Additional information may be obtained from the Chairman, Department of Human Environmental Sciences Communications, 117 Gwynn Hall, Columbia, Mo. 65211.

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 analysss of results and drawing conclusions.

450—Research (cr. arr.). Independent research not leading to thesis. Report required.

490—Research (cr. arr.). Independent research leading to thesis or dissertation.

Human Nutrition and Foods

College of Human Environmental Sciences
217 Gwynn Hall (314)882-4288

FACULTY

Richard Dowdy, chairman, director of graduate studies, associate professor, PhD, North Carolina State University

Laura Hillman, professor, MD, Yale University

Loretta Hoover, professor, PhD, University of Missouri-Columbia

Roger Sunde, professor, PhD, University of Wisconsin

Gretchen Hill, associate professor, PhD, Michigan State University

Karla Hughes, associate professor, PhD, University of Tennessee

Gabriella Molnar, associate professor, PhD, Vanderbilt University (Lincoln University)

James Nordstrom, associate professor, PhD, University of Minnesota (Lincoln University)

Gail Gates, assistant professor, PhD, Pennsylvania State University

Candace Holdt, assistant professor, PhD, University of Nebraska

Pearlly Yan, assistant professor, PhD, Iowa State University

Lucy Zahler, assistant professor, PhD, University of Wisconsin

DEGREES: MS in human nutrition and foods, and PhD in human environmental sciences, with an emphasis area in human nutrition, foods and food systems management

Candidates for the MS degree may specialize in human nutrition, food research, food systems management, human nutrition and foods or nutrition education. Those students selecting the PhD degree may specialize in human nutrition or in food systems management.

The MS degree prepares students for 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 dietetics, extension or other adult education programs, in food production and quality control, in government or service-sponsored nutrition assistance agencies, or in the private practice of dietetics. The PhD degree can lead to careers in research, college or university teaching and research, in research direction in industry, government and higher education, or in other institutions, or to administrative positions related to foods, nutrition or food service management.

See **Human Environmental Sciences** for general information.

Additional information may be obtained by writing the Director of Graduate Studies, Department of Human Nutrition and Foods, 217 Gwynn Hall, Columbia, Mo. 65211, or by calling (314) 882-4288.

COURSES

224—Meat Selection and Identification (3) (same as Food Science and Nutrition 224).

228—Principles of Food Systems Management (3-4) (same as Food Science and Nutrition 228). 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.

234—Human Nutrition I (3). Basic concepts of normal nutrition related to physiological/chemical processes, changing nutrient needs during human life cycle, with emphasis on adult and some social/psychological influences on dietary habits. Prerequisites: organic chemistry, physiology or instructor's consent.

235—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. Prerequisite: 234 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 individuals at risk. Prerequisites: 234, 235 (may be taken concurrently), Psychology 1 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 (3-4). Disease processes and principles underlying diet therapy. Guided experience in planning, delivering and evaluating dietetic care. Prerequisite: 234.

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: 235, 236, sociology or instructor's consent.

300—Problems (cr. arr.). Library or lab and problems selected for study by student with guidance of staff member. Prerequisites: 200-level course in field of problem, senior standing and instructor's consent.

311—Investigation of Food Properties (3). Study of the chemical and physcial properites of foods and the interaction of food components. Lecture and laboratory. Prerequisites: 121 and organic chemistry.

318—Topics (cr. arr.). Selected current topics in field of interest. Prerequisite: junior standing.

320—Cultural Food Patterns (2). World food patterns including their nutritional significance. Applies scientific principles to preparation of these foods. Lecture and laboratory. Prerequisite: 21 or 121.

321—Experimental Foods (3). Introduces scientific method of problem solving with food. Group and individual research. Prerequisite: 221 or instructor's consent.

322—Food Experiences for Children (3) (same as Curriculum and Instruction T322). A combination of food and nutrition concepts with laboratory experiences for teaching the child, followed by planning and developing materials activities for teaching these concepts to children. Prerequisite: junior standing.

324—Food Production in Food Service 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. Prerequisite: 228 or instructor's consent.

325—Food Procurement and Fiscal Management (6). Lecture course meeting entry level management competencies for quantity food purchasing, nutritional and quality attributes, personnel administration, materials management and fiscal control. Prerequisite: 324.

326—Food Service Equipment and Facility Design (3) (same as Food Science and Nutrition 326). Systems approach to planning and team approach to layout of facilities and preparation of specifications for equipment. Prerequisite: 325.

327—Operations Analysis in Food Systems (3-4) (same as Food Science and Nutrition 327). Application of concepts of quantitative methods of management science to optimize decisions concerning policies, design and procedure for control and evaluation of food systems. Prerequisites: 228 and 324.

328—Management of Food Systems (1-2). Principles of organization/management in various institutional food service facilities. Prerequisites: 228 and 324.

330—Child Nutrition (3) (same as Human Development and Family Studies 330). Applies nutrition principles to feeding children from infancy through adolescence. Prerequisite: a course in nutrition.

333—Human Nutrition II Laboratory (1). 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.

335—Nutrition During the Life Cycle (3) (same as Nutrition 335). Nutritional, physiological and environmental influences on the aging process of man from conception through senescence. Prerequisite: 334 or equivalent.

338—Advanced Clinical Nutrition (3-6). Continuation of study of nutritional care for chronic and acute medical and surgical problems and the role of diet in the etiology of disease and diet modifications in overt disease conditions. Prerequisites: 237, 334 or instructor's consent.

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 profes-

sional attitudes relevant to practice. Prerequisite: 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: eight hours of course work in field of subject and instructor's consent.

355—Recent Trends (1-2). For upperclass and graduate students who wish additional knowledge and understanding in specific areas.

390—Field Training (cr. arr.). Prerequisites: junior or senior standing and instructor's consent.

400—Problems (cr. arr.). Prerequisite: instructor's consent.

410—Seminar (1-4). Reports and discussion of recent work in area of concentration.

415—Readings (cr. arr.). Prerequisites: 15 hours of course work in field of subject and instructor's consent.

418—Topics (cr. arr.). Selected current topics in field of interest.

421—Advanced Experimental Foods (3). Further development of the concepts and experience in planning, conducting, interpreting and reporting food preparation research. Prerequisite: a 200-level statistics course.

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. Prerequisite: 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.

436—Advanced Nutrition (3). Lecture-discussion of current and classical literature, emphasis on normal nutrition. Prerequisite: 334 or instructor's consent.

450—Research (cr. arr.). Independent research not leading to a thesis. Report required

461—Nutritional Endocrinology (2) (same as Food Science and Nutrition 415). 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, Biochemistry 272 and Biochemistry 274.

490—Research (cr. arr.). Independent research leading to thesis or dissertation.

Industrial Engineering

College of Engineering
113 Electrical Engineering Building
(314)882-2691

FACULTY

Larry G. David, chairman, director of undergraduate studies, professor, PhD, Purdue University

Han P. Bao, director of graduate studies, associate professor, PhD, PE, University of New South Wales, Australia

Owen W. Miller, director of graduate studies-Kansas City Engineering Program, professor, DSc, Washington University

C. Alec Chang, associate professor, PhD, Mississippi State University

Cerry M. Klein, associate professor, PhD, Purdue University

Luis G. Occena, assistant professor, PhD, Purdue University

Hahn-Kyou Rhee, assistant professor, PhD, University of Florida

DEGREES: MS and PhD in industrial engineering

COOPERATIVE DUAL DEGREES: MBA and MS in industrial engineering and MS in public health, with an emphasis area in health services management

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 necessitating 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, as well as 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.

Laboratory facilities in several major application areas, both within the department and in other departments with related interests, support the academic program. Neighboring industries, city, county and state government agencies, local hospitals and nearby large metropolitan centers provide an unlimited 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 microcomputers for student use. In addition to Ellis Library facilities, an excellent collection of mathematical, statistical and engineering books and reference materials are housed in the engineering 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, as well as through research grants from various industrial and governmental agencies.

For additional information write the Director of Graduate Studies, Department of Industrial Engineering, Columbia, Mo. 65211, or call (314) 882-2691.

MASTER'S DEGREE: Two basic programs lead to the MS degree:

- a 32-credit-hour research-oriented program requiring a thesis
- a 32-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 four-course core common to all master's candidates and a four-course concentration around which students can mold their overall academic effort. The curriculum covers application of probability and statistics to engineering and systems analysis problems, the interface between industrial engineering and the management function and fundamentals underlying decision-making processes.

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 combined quantitative plus verbal score of 1,050 on the general test of the GRE also is required of all students. A TOEFL score of 530 is required of all international applicants whose native language is not English.

DUAL MS DEGREE PROGRAMS: The Department of Industrial Engineering, in cooperation with the College of Business and Public Administration, offers a dual MS 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 Engineering, in cooperation with the health services management program of the School of Medicine, offers a dual MS 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 public-health program, and the required courses in the public-health program are used as electives in the industrial engineering program. As a result, it is possible for the student to earn an MS in public health 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 work, high GRE scores and strong indications of research potential. The granting of a PhD requires completion of five major requirements:

- a qualifying examination
- a course of study
- comprehensive examination
- acceptance of dissertation proposal
- final public defense of the completed dissertation

While many students earn an MS degree before pursuing a PhD program, an MS is not a prerequisite to admission.

Areas for PhD program research include manufacturing systems, production planning and control, mathematical programming computational methods, statistical data analysis and response surface technologies, human factor engineering, 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

207—Operations Research Methods (3). Study of quantitative methods necessary for analysis, modeling and design of optimal industrial systems. Prerequisites: Engineering 20 and Mathematics 201.

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 and testing of hypotheses. Linear and non-linear 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: Engineering 20. Corequisite: 239.

281—Industrial Systems Design I (3). Sequence of simple systems design problems. Several numerical analysis techniques integrated into the design problems. Opportunities provided for building skill in computer programming. Prerequisite: introductory course in computer programming.

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—Plant Layout and Materials Handling (3). Facilities arrangement and economic selection of materials-handling equipment in a plant or office. Emphasizes optimization of materials and information flow. Prerequisites: 258, 261 and 385.

371—Applied Robotics in Production (3) (same as Mechanical and Aerospace Engineering 371). Robot structures and arm geometry, drive systems and effectors, work station design, reliability, management aspects, economic factors, applications in various industries and flexible manufacturing systems. Prerequisites: 207, and Mechanical and Aerospace Engineering 185 or Civil Engineering 185.

372—Integrated Production Systems (3) (same as Mechanical and Aerospace Engineering 372). Applications and standard program files of NC, DNC, CNC machines and industrial robots; CAD/CAM and automated inspections; and computer integrated production and support systems. Prerequisites: 207 and 385.

376—Survey of Operations Research Models (3). Introduces queueing models, competitive games, replacement models, inventory models, scheduling models and network theory. Prerequisites: Engineering 132 or a course in introductory probability.

381—Industrial Systems Design II (4). Series of industrial systems design problems, each structured to integrate material presented in several theory or methods courses. Prerequisite: senior standing. Co-requisite: 351.

383—Management Information Systems Design (3). Review of management and organizational structure and theory, concepts of information and data structures, transaction processing, computer hardware and telecommunications considerations. Prerequisite: Engineering 20.

384—Industrial Process and Distribution Control Systems (3). Use of computer information systems (including minicomputers and microcomputers) in controlling manufacturing and related processes. The distribution function, including inventory and transportation. Prerequisites: 385 and Engineering 124.

385—Manufacturing Systems Design (3). Design project involving development and the analysis and comparison of alternate methods of manufacturing a product. Extensive survey of a variety of manufacturing methods is included. Prerequisites: Chemistry 11 or 5, and Engineering 85.

387—Linear Programming (3). Theory and application of linear programming. Prerequisite: 207.

388—Industrial Systems Simulation (3). Construction of simulation models, methods of generation of stochastic variates, time incrementation, verification. Design of simulation experiments and use of special purpose simulation language. Prerequisites: 239 and 397.

397—Operations Research Models (3). Formulates mathematical models and determines optimal policies for inventory, replacement, competitive and queueing systems. Introduces dynamic programming. Prerequisites: 207, Engineering 132 and Mathematics 304.

398—Scheduling Systems (3). Quantitative methods for forecasting, scheduling and controlling production in complex manufacturing systems. Prerequisites: 207 and Engineering 132.

400—Problems (cr. arr.). 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.

411—Scientific Management (3). Theory and basic principles of scientific management in engineering. Writings of Eaylor, the Gilbreths, Gantt and other pioneers of scientific management. Growth of modern industrial management from principles of scientific management.

415—Advanced Economic Studies in Engineering (3). Theoretical basis for engineering economy methods, problems of parameter estimation, and depreciation and replacement studies. Prerequisite: 258.

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 supplied, or both, have a probabilistic nature. Prerequisite: 239.

439—Quality Control Systems (3). Design of acceptance sampling plans and quality control tests based upon the power function criterion and the Bayesian minimum cost criterion. Prerequisite: 349.

440—Advanced Evaluation of Engineering Data (3). Application of advanced statistical methods for the analysis of engineering design and experimental problems. Prerequisite: 239.

461—Health Care Systems Design I (3). Health-care systems design principles and major problems, basic organization within health-care system, alternative system design strategies, factors affecting design process success. Prerequisites: Health Services Management 310 concurrently or instructor's consent.

470—Operations Research Applications (3). Applications of operations research methods, including queueing, inventory, sequencing, competitive strategies, replacement and networks. Prerequisites 239 or a course in introductory statistics.

472—Nonlinear Optimization (3). Introduces computational non-linear mathematical programming procedures and 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 and 387.

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.

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. Prerequisite: 387.

490—Research (cr. arr.). Independent investigation in field of industrial engineering to be presented as a thesis.

Human Nutrition and Foods

Journalism

School of Journalism
116 Walter Williams (314)882-4852

FACULTY

R. Dean Mills, dean, professor, PhD, University of Illinois
James D. Atwater, professor, BA, Yale University
Donald J. Brenner, professor, PhD, University of Missouri-Columbia

International Development

727 Clark Hall (314)882-9508

FACULTY

Alvin S. Lackey, director, professor, PhD, Cornell University.

This interdisciplinary minor is available to any graduate student interested in studying Third World development. The minor requires 12 semester hours including one required course.

Students interested in learning more about this minor should write the director, 727 Clark Hall, Columbia, Mo. 65211, or call (314)882-9508.

Daryl R. Moen, professor, MA, University of Minnesota
Won H. Chang, professor, PhD, University of Iowa
Roger A. Gafke, professor, MA, University of Missouri-Columbia
Rod Gelatt, professor, MA, University of Iowa
Robert P. Knight, professor, PhD, University of Missouri-Columbia
Edmund B. Lambeth, professor, PhD, American University
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
Vernon A. Stone, professor, PhD, University of Wisconsin
Lee Wilkins, professor, PhD, University of Oregon
Betty Winfield, professor, PhD, University of Washington
Brian S. Brooks, associate professor, MA, University of Missouri-Columbia
Phillips Brooks, associate professor, MA, University of Missouri-Columbia
James K. Gentry, associate professor, MA, University of Missouri-Columbia
J. Robert Humphreys, associate professor, MA, University of Missouri-Columbia
Robert A. Logan, associate professor, PhD, University of Iowa
Michael McKean, associate professor, MA, Rice University
Wes Pippert, associate professor, MA, Wheaton College
Guy W. Tunnicliffe, associate professor, MBA, Case-Western Reserve University
Charles Warner, associate professor, MA, Southern Illinois University
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
Nancy Bowman, assistant professor, JD, University of Kentucky
Jan Colbert, assistant professor, MA, University of Missouri-Columbia
Lillian Dunlap, assistant professor, MA, Indiana University-Bloomington
Tim Gallimore, assistant professor, MA, Indiana University-Bloomington
Henry Hager, assistant professor, BA, Yale University
Nancy Beth Jackson, assistant professor, PhD, University of Miami
Lee Jolliffe, assistant professor, PhD, Ohio University
Sandra Scott, assistant professor, PhD, University of Conneticut-Stors
Charles Sherman, assistant professor, MS, Columbia University
Kurt Wildermuth, assistant professor, 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 Associate Press and the New York Times Service, KOMU-TV, an NBC affiliate, and KBIA-FM, an NPR station, 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 holds more than 15,000 volumes. The State Historical Society of Missouri Library 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. 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 Media Research Bureau 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.

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 and the J. C. Penney-Missouri Awards for community journalism. The Missouri Multicultural Management Program annually brings minority journalists to the school for a month of workshops designed to spur their career development and to enhance the multicultural understanding of all journalists.

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 February 1 for the following year.
For details, write to the Associate Dean of Graduate Studies, School of Journalism, Box 838, Columbia, Mo. 65205.

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; combinations of the three.

Applicants must submit an application for graduate admission, transcripts, a completed graduate program questionnaire and three letters of recommendation. Minimum standards for acceptance include an undergraduate GPA of 3.0 (A=4.0) and a verbal/quantitative GRE total of 1,000. 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 1,100. 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 550. Information about requirements and deadlines for I-20 forms or, visas, may be obtained by writing the Coordinator of International Student Programs (A02 Brady Commons, Columbia, Mo. 65211).

Students choose from 11 program options: advertising, broadcast news, design, editing, international, magazine, media management, news media and society, photojournalism, public policy and reporting/writing. Students must complete all course requirements in the selected option and complete either a thesis or a professional project.

Students interested in public affairs reporting may choose to complete a professional project in an off-campus program. The Washington, D.C., program, directed by a full-time faculty member, is housed in the National Press Building. 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 hours, at least half of which must be in 400-level courses. Specific course requirements vary depending on option selected. MA candidates are required to pass a comprehensive examination, which is offered once each semester. Students must enroll in either the Project Seminar or the Thesis Seminar and develop proposals for their professional project or thesis.

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.

Students must specialize in three academic areas, two in journalism (for example, mass media and society or communication law) and one in another academic discipline (for example, political science). The program usually requires at least three years of full-time study beyond the MA degree (50 to 65 hours beyond the master's degree, or 90 graduate hours). 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 Graduate Program Questionnaire 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 1,100 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 550. 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 two years of college-level foreign language courses or an equivalency acceptable to the doctoral faculty. 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 defined as one that is nonnative 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.

Students are admitted to the PhD program in journalism when they have passed a qualifying examination, which must be taken the semester after completing nine graduate hours applicable to the degree. A candidate who fails the examination must take it again the next time it is offered. It may not be taken more than twice. Graduate School regulations about comprehensive examinations, dissertations, plans of study, residency and other matters are specified in the general section of the Graduate Catalog on doctoral degrees.

COURSES

300—Problems (1-3). For undergraduates only. Individual research under directio nof a faculty member. Project must be set up with instructor before registration. Prerequisite: departmental chairman's consent.

301—Topics in Journalism (1-3). Selected current topics in journalism. Specific topics to be announced at time of registration.

302—The Foreign Press (2). Major press systems of the world, with emphasis on the print media and differing journalistic concepts. Leading newspapers and magazines of the principal nations, with some consideration given to news agencies and broadcasting.

303—International Journalism (2) (same as Peace Studies 302). News facilities around the world, barriers in international communications, press problems of developed and especially of developing nations, friction and understanding created by the press.

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.

305—Critical Reviewing (2). Book, movie and theatre.

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 and writing under deadline conditions. Prerequisite: 104 or 105.

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 and 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. Prerequisite: 104 or 105.

310—Newspaper Editing (3). Laboratory work on the Columbia Missourian plus lectures on ethics, page design and news decision making. Prerequisite: 110.

311—Advanced Newspaper Editing and Design (3). Continuation of desk editing with emphasis on page design, graphics and typography. Prerequisite: 310.

312—Communications Practice (1-2). Special laboratory instruction for seniors in various departments of the school's media. Enrollment must be completed in the office of the dean, with permission of instructor.

313—Internship (2). Credit for approved employment in journalism. Specifications for this course appear in the Undergraduate Catalog.

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.

316—Science Writing (3). Advanced course reporting science, medicine and environment. Write for publication. Prerequisites: 306 and instructor's consent.

317—Women and the Media (2). 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, and research and writing skills. Prerequisite: junior standing.

318—Introduction to Selling for the Mass Media (2). 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 320.

319—Dynamics of Advertising Laboratory (1). Two hours of weekly laboratory in fundamental advertising execution. Project. Prerequisites: graduate standing and instructor's consent. Must be taken concurrently with or after 320.

320—Dynamics of Advertising (2). Surveys factors influencing advertising. Emphasizes basic values, functions, procedures, evaluation and organization of advertising. Term paper. Prerequisites: instructor's consent and graduate standing.

321—Advertising Copy and Layout (3). Focuses on developing print and broadcast ads that produce results, with due attention given to the critical analysis of advertisting problems and the development of a creative strategy. Prerequisites: 120 and 121.

323—Advertising Salesmanship (3). Professional sales techniques, account service, advertising production, cooperative advertising, offset techniques and market data. Students assigned retail and classified accounts for which they will prepare, service and sell advertising. Prerequisite: advertising core courses.

324—Advertising and Public Relations Campaigns (2). 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 and instructor's consent.

326—Broadcast Advertising (2). 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. Prerequisite: advertisting core.

327—Direct and Mail Order Advertising (2). Direct mail advertising and mail order promotion, retail and national, mailing lists, copy, production, postal regulations and strategy. Prerequisite: advertising core courses.

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.

329—Creative Strategy and Tactics (2). 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.

330—Media Strategy and Planning (2). 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 researhc information sources. Prerequisites: 120 or 320, 333, and Marketing 204.

331—Advertising Management (2). Methods for gathering, evaluating and organizing material pertinent to the solution of advertising problems. Uses case studies. Prerequisite: advertising core courses.

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. Prerequisite: 120 or 320.

333—Research in Advertising (2). Introduction to techniques and practice of advertising research. Emphasis on understanding research techniques and use of research results. Consumer analysis, attitude measurement, print and broadcast copy testing and evaluation of externally supplied research. Prerequisite: junior standing.

334—International Advertising (2). Background for planning and executing advertising campaigns in international markets and relating them to economic, cultural and political environments. Prerequisite: advertising core courses.

335—Sales Promotion (2). Study of the various techniques and methods of using sales promotion as part of the promotional mix. Students will examine its synergistic relationship with advertising and sales. Project required. Prerequisite: advertising core courses.

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 desk-top publishing. Prerequisite: junior standing.

337—Advertising Design (2). An advanced course in advertising graphics, layout and production. The course is designed for students who are seeking a career in advertising art direction. Final portfolio presentation. Prerequisite: advertising core courses.

338—Business and Economics Reporting (3) (same as Finance 338, Management 338 and Marketing 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.

341—Staff Photography (3). A laboratory course exploring

the photojournalist's role in the news gathering process. As staffers for the Columbia Missourian, students cover news, sports, features, food assignments and originate single pictures and stories. Prerequisite: 344.

342—Photojournalism (4). 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: 341.

344—Intermediate Press Photography (2). Advanced techniques and problem solving in photojournalism. Stresses lighting techniques available, studio, electronic flash and color correction of color film. Strobed documentary, portraiture, fashion, food, architecture and sports. Prerequisite: 140.

345—General Semantics in Journalism (2). The everyday usefulness of science methodology as applied to the journalist's personal professional problems. The course deals with general effect of language habits on journalists and on their readers-listeners.

350—Broadcast Reporting (3). Instruction in principles, ethics and techniques of gathering information, writing and using videotape and audiotape to report news for radio and television. Includes working as reporters at KBIA. Prerequisite: 150.

351—Broadcast Research Applications (2). Content analysis, audience measurements, polling techniques. Students conduct public opinion surveys, prepare radio and television news stories from survey findings. Prerequisite: 448.

352—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.

353—Radio News Reporting and Editing (1). Preparation of newcasts for KBIA; recorded and live performance skills; emphasis on beat reporting, preparation of expanded, multi-source extended reports for daily half hour magazine format program. Prerequisites: 353, instructor's consent.

356—Television News Reporting and Editing (3). Reporting and writing news stories, recording and editing videotaphe, for news broadcasts on KOMU-TV. Emphasis on use of electronic-news gathering equipment, including satellite transmission. Prerequisite: 350, instructor's consent.

357—Issues in Broadcast Management (2-3). Broadcast administration, sales, programming, network, relationships, community involvement, labor, FCC procedures, cable TV and new technologies. Prerequisite: instructor's consent.

358—Television News Producing (3). Instruction in techniques of television newscast preparation. Emphasis on role of the television news producer. Prerequisites: 356, instructor's consent.

360—Intermediate Writing (3). In-depth research and writing techniques. Students produce articles for the Missourian weekend magazine and other publications. Prerequisites: 306 or equivalent and instructor's consent.

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.

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. Prerequisite: 336.

363—Magazine Editing (3). Review of grammar, punctuation and style rules, measuring articles, copy fitting, writing captions, titles, editing, proofreading, condensing and rewriting magazine articles. Prerequisites: 109 and 306.

364—Organization Communication in Public Relations (2). 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: 104 and 332.

365—Magazine Production (3). Editing, copy reading, cutline/headline writing, decisions on articles on Weekend magazine or other magazine projects. Prerequisites: 360, 363 and instructor's consent.

366—Advanced Magazine Design (2). Continuation of 362. Class critiques of spreads, sequences and magazines are implemented by students who make typographic specifications and lay out individual spreads, and complete magazines for actual printed production.

368—Magazine Publishing (2). The audience, economics, job opportunities and content of the American magazine. Deals with general audience and specialized magazines, business and institutional magazines and news magazines. Case histories of individual magazines and guest lecturers from various fields.

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. Prerequisite: 104.

375—Newspaper Management (2). Organization, accounting methods, personnel, rate structures, equipment, production, and laws and regulations of concern to newspaper management. Prerequisite: 120.

377—Newspaper Graphics Desk Management (3). Survey of management of photographic journalism, art illustration and design in newspapers including work on graphics desk of Columbia Missourian. Prerequisites: 341 or 336 or 363 and instructor's consent.

381—Television Photojournalism (3). Study of the role of video in presentation of television news stories. Emphasis on new techniques and changes in the professional field. Work at KOMU-TV. Prerequisite: 356.

382—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, 356 or instructor's consent.

386—Economics of the Media (2). Examination of economic environment of mass media. Examine mass media as they are affected by advertisers, competition, financial markets and other forces. Prerequisites: three hours of economics and instructor's consent.

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.

399—Media Management and Leadership (3). Supervisory aspects of media organizations. Functions of managers (planning, organizing, motivating, etc.), leadership, group dynamics, organizational structure, etc. Prerequisites for students without media experience: 306 and 310, or 321 and 329, or 353 and 356, or 361 and 363, and instructor's consent.

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.

401—Mass Media Seminar (3). Concepts, functions and major problems of print and electronic media in the United States. Two-hour lecture and one-hour discussion lab each week.

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 and professionalism.

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.

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. Prerequisite: 304 or instructor's consent.

408—Research Methods in Journalism (3). Research methods of utility in journalism and philosophy of science. Emphasis on survey research, sampling procedures, questionnaire construction and interviewing techniques. Prerequisite: six hours of journalism or instructor's consent.

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.

424—Theory of Mass Communication (3). Major communication theories and theorists. Intrapersonal theories are included as they relate to mass communication.

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.

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. Prerequisite: instructor's consent.

436—Theory of International Communications (2). Broad theories associated with the flow of communication intranationally and internationally. Each student develops an original hypothesis and defends it in a term paper.

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.

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.

442—Information Theory (3). Concepts and functions, information storage, retrieval and indexing via electronic computer.

446—Media Ethics (3). An introduction to and application of ethical theory to the contemporary mass media. Prerequisite: senior/graduate standing.

447—Critical Analysis of the Mass Media (3). An overview of both the content and method of contemporary media criticism. Prerequisite: graduate standing.

448—Readings in Journalism (1-5). Directed readings for doctoral candidates. Designed to supplement work in other courses, broaden student's knowledge of trends, interpretations and developments in the media.

452—Advanced Seminar, Theory of Communication (2). In-depth investigation of communication theory, with emphasis on problems of theory building in communication. Prerequisite: 402 or 404 or instructor's consent.

458—Advanced Research Methods (3). Experimental design, factor analysis, semantic differential and Q methodology as tools for the researcher in journalism/communication. Prerequisite: 408.

460—Industry and Career Leaders Seminar (1). Course helps students develop skills for appropriate professional careers, examine media leadership issues, write research paper.

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 professional 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 the thesis.

476—Area Seminar (3). Seminar designed to accompany 499. Through readings and discussions the Plan B student examines the special area related to the project.

478—Area Problem (4-9). Work project enabling Plan B student to demonstrate professional competence; one may be offered in a graduate reporting program or a creative project designed to meet a particular interest of student.

490—Research (1-9). Guidance for graduate students en-

gaged in plan A for the MA degree and for all doctoral candidates engaged in investigations looking toward production of theses.

Laboratory Animal Medicine Area

Graduate School
M144 Medical Science Building (314)882-3111

FACULTY

Joseph E. Wagner, chairman, professor of veterinary pathology, DVM, Iowa State University, PhD, University of Illinois

Ronald McLaughlin, director of graduate studies, associate professor of veterinary microbiology, DVM, Iowa State University

Sara E. Walker, professor of medicine, MD, University of Texas-Galveston, BA, University of Texas-Austin

Cynthia L. Besch-Williford, assistant professor of veterinary pathology, DVM, Louisiana State University, PhD, University of Missouri-Columbia

Richard E. Fish, assistant professor of veterinary biomedical sciences, DVM, PhD, University of Tennessee

Reuel R. Hook Jr., associate professor of microbiology, PhD, University of West Virginia

Lela K. Riley, assistant professor of veterinary pathology, PhD, University of Kansas

Earl K. Steffen, assistant professor of veterinary pathology, PhD, University of Missouri-Columbia

DEGREE: MS in laboratory animal medicine area

This three-year, postdoctoral program meets the training requirements for eligibility for the American College of Laboratory Animal Medicine (ACLAM) certification examination and prepares graduates for 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) executive committee. In addition applicants must meet standards for admission to the Graduate School.

The LAMAP includes residency rotations, graduate course work and research training. During the first 18 months 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)
- research training in the laboratory of an established investigator

The last 18 months are spent with half-time devoted to research training under an established investigator and half-time 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.

Required graduate courses include diseases and pathology of laboratory animals, methodology of animal experimentation, biology of laboratory animals, laboratory animal resource management, statistics and seminar.

Elective courses frequently taken by trainees include advanced histopathology, oncology, genetics, immunology, biochemistry 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. Examples of previous and current research subject matter include soft tissue mineralization in mice, pathogenic Escherichia coli in hamster enteritis, antibodies to Encephalitozoon cuniculi, autoimmune thyroiditis in guinea pigs, histoplasmosis in chinchillas, feline cytauxzoonosis, melanomas in swine, diabetes mellitus in Mystromys albicaudatus, trichophyton infection of rabbits, proliferative ileitis of hamsters, Tyzzer's disease in research animals, Hageman trait in cats (factor XII deficiency), nasal dermatitis in gerbils, mycoplasmosis in rats, actinobacillus infections in laboratory mice and salmonellosis of laboratory animals. The MS degree requires the completion of a thesis or a significant manuscript suitable for publication in a referred journal, or an approved equivalent scholarly effort. Requirements for elective course work, residency and teaching experience are determined with the students' advisory committee.

Typically there are 10-15 postdoctoral fellows in the program at one time. Networking and sharing of experiences and cooperation among fellows has proven to be 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, in addition to a solid didactic program and research experience, prepares graduates for a variety of laboratory animal positions in academia and industry.

Two-year degree-training programs emphasizing 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.

Programatic strengths include:

- 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
- a substantial number of board certified faculty in laboratory animal medicine

Financial support is usually by stipends from an institutional NIH Training Grant, individual NIH postdoctoral fellowships and diagnostic laboratory or state funds.

To apply for the program, send a copy of your veterinary college transcript, a curriculum vitae, GRE general test scores, if available, and the names of three individuals we may write to J.E. Wagner, DVM, W213 Veterinary Medicine Complex, Columbia, Mo. 65211.

Journalism Library and Informational Science

COURSES

400—Problems (cr. arr.). Advanced studies not expected to terminate in a thesis.

401—Topics (cr. arr.). Courses with lectures in various specialized topics in laboratory animal medicine will be given on a trial basis, depending on faculty expertise and student demand. Prerequisite instructor's consent.

410—Seminar (1). Discussion of current research methods and regulations in laboratory animal science.

437—Pathology of Laboratory Animals (4) (same as Veterinary Pathology 437). Gross and microscopic study of spontaneous and naturally occurring diseases in laboratory animals. Prerequisite departmental consent.

450—Research (cr. arr.). Research not expected to terminate in a thesis.

468—Laboratory Animal Biology (4). Reproduction, genetics, nutrition and husbandry of common laboratory animal species, including dogs, cats, rodent, lagamorphs, nonhuman primates, birds and cold-blooded vertebrates. Prerequisite departmental consent.

469—Laboratory Animal Resource Management (3). Policies, standards and regulations in the care and use of laboratory animals, including colony management, animal procurement, cost accounting, faculty design and supervisory skills. Prerequisite consent of department.

475—Methodology of Animal Experimentation (1). Application of specific species or strains of animals and techniques to various types of biomedical investigation. Prerequisite consent of department.

490—Research (cr. arr.). Research expected to terminate in a thesis.

Library and Informational Science

School of Library and Informational Science
104 Stewart Hall (314)882-4546

FACULTY

Mary F. Lenox, dean, associate professor, EdD, University of Massachusetts

Ronald R. Powell, chairman-library science, associate professor, PhD, University of Illinois

Thomas R. Kochtanek, chairman-information science, associate professor, PhD, Case Western Reserve University

MaryEllen Sievert, director of graduate studies, associate professor, PhD, University of Missouri-Columbia

C. Edward Carroll, professor, PhD, University of California

Donald R. Shurtleff, professor, PhD, Worcester Polytechnic Institute

Hellmut Lehmann-Haupt, professor emeritus, PhD, University of Frankfurt

Francis J. Flood, associate professor emeritus, AMLS, University of Michigan

Roy W. Evans, associate professor, PhD, Southern Illinois University

Emma Jean McKinin, assistant professor, MA, University of Missouri-Columbia

DEGREE: MA in library science

Specialization is possible in academic, public, school and special (including medical and law) libraries, in information science, reference work, cataloging, children's and adult services and in

archive administration.

Ellis Library, with its extensive collections in many subject areas, offers support to the teaching and research programs in library science and in information science. The library's computerized record system is especially significant for teaching newer facets of librarianship. In addition, excellent libraries in the vicinity are available for observation or work experience.

A number of assistantships, limited to candidates for the MA in library science, are available for half-time employment in Ellis Library. There are some graduate teaching assistantships in the school.

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 Miller Analogies Test or GRE is required. People whose undergraduate GPA is below 3.0 may be considered, provided they have outstanding scores on aptitude tests.

The course of study requires completion of at least 36 hours graduate credit, of which at least 15 must be in 400-level courses, and at least 18 must be taken on campus after acceptance for advisement. These 36-semester hours must include the following courses: Library Science 312, 332, 326, 341, 450 and Information Science 401. In addition, IS 101 must be taken for non-graduate credit before or concurrently with IS 401. Qualified students may test out of IS 101.

To fulfill requirements for the degree, students must pass a comprehensive written examination administered by the faculty of the School of Library and Informational Science.

COURSES

LIBRARY SCIENCE

312—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.

321—Library Materials for Children and Youth (3). Background of library materials for children; psychology of childre, youth; characteristics in use of print, nonprint material; current publishing trends. Readers guidance, book talks, resources, story-telling resources.

322—Literature of the Humanities (3). Library collection development and information services in the visual and performing ars, language and literature, philosophy, and religion; major figures and classic works; schools, movements, and trends in publishing and research, bibliographical organization of the literature.

323—Literature of the Social Sciences (3). Publishing trends, major authors and their works, and special library problems in history, political science, economics, geography, sociology, psychology and related fields.

324—Literature of Science and Technology (3). Nature of science, growth, communication, use and accessibility of scientific information. Emphasis on scope of literature and tools in scientific disciplines, and techniques of retrieving information through printed and computerized data bases. Includes information problems in interdisciplinary areas.

325—Use of Public Documents and Records (3). Introduction for non-library science students to the value, variety and use of public documents and records, providing an overview of government generated/produced materials as information sources.

326—Developing Library Collections (2). Selection and acquisition of library materials, including sources of print and non-print materials, collection development policies, community needs analysis, acquisition practices, evaluation techniques and special issues such as censorship, racism and sexism.

327—Preservation and Restoration (3). Theoretical and practical work with archival and manuscript materials, rare books and media, concerned with methods and materials for preservation and restoration.

332—Bibliography and Reference (3). National, trade and subject bibliography, general reference tools (encyclopedias, dictionaries, handbooks), selected information sources in major subject areas, and principles, developments and trends in reference service.

341—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.

342—The Administration of School Libraries/Media Centers (3) (same as Curriculum and Instruction T378). Purposes, objectives, functions and activities of the school learning resource center; qualifications of personnel; physical facilities; standards.

350—Special Readings (cr. arr.). Individual study on specific subjects in library and information science performed under the direction of an assigned faculty instructor.

351—Library Research in Special Areas (cr. arr.). 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.

380—Practicum (1-3). Supervised work in a school, public, special or college library. Prerequisite: departmental consent.

400—Problems (cr. arr.). Independent, directed study on a topic in the field of library science. Prerequisites: departmental consent.

410—Seminar in Library Science (1-3). Discussion and critical study of current developments in library science. Prerequisite: admission to candidacy for master's degree in library science or departmental consent.

416—Medical Subject Analysis (3). Medical terminology comprehension, indexing policies, and searching procedures for National Library of Medicine's on-line and printed data bases in the health sciences, and cataloging and classification systems in health science libraries.

424—Micrographics and Libraries (3). Types of microforms and their acquisition, handling, interpretation and utilization. Basic technical considerations include evaluating hardware, building collections, bibliographic control and the microform environment.

425—Government Publications (3). Survey of publications of municipal, state, United States, and international governmental units. Special attention given to principles and techniques of administering a public documents collection.

426—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. Prerequisite: 312.

427—The History of Books and Printing The Manuscript Book (2-3).

428—The History of Books and Printing The Printed Book (2-3).

429—Seminar in Rare Books and Manuscripts (3). Selected topics in the history of books and the antiquarian book trade.

433—Services to Children (3). Collection development, organization of children's services, preschool activities, relations with the school library and story-telling techniques.

435—Studies in Library Services (3). Directed toward students' interests, with individual projects a significant part of course. Attention given to services to people with physical disabilities, culturally deprived, industry and adult-education groups.

436—Legal Bibliography and Reference (3). Teaches the basic sources and methodologies in legal research. The LEXIS and WESTLAW systems also are explored.

442—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).

443—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.

444—The Public Library (3). Objectives, relations with other institutions, scope of library services, public relations and standards.

445—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.

446—Health-Science Librarianship and Bibliography (3). Principles of management for health sciences libraries, including organization, administration, communication, planning and evaluation of personnel, materials, services, and facilities. Availability and use of sources of information in health sciences.

447—Archives Administration (3). 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.

448—Seminar in Records and Manuscript Management (3). Advanced seminar on the development of techniques for archival and manuscript management. Deals with issues and problems of institutional relationships, operational planning and programming, and implementation of archival operations.

449—History of Libraries (3). Development of libraries and library services from ancient times to present, the role of libraries in different times, societies, identification of problems faced by librarians and analysis of solutions.

450—Research (cr. arr.). Investigation and research into a topic not leading to a thesis. Prerequisite: departmental consent.

451—The Biomedical Community (3). Survey of the backgrounds and expertise of different health professionals; organization, costs and payment of health care in the U.S. and other national systems; and the role of the health sciences librarian in the biomedical community.

INFORMATION SCIENCE

302—Quantitative Methods for Information Systems and Services (3). Design and implementation of analytical methods for evaluation of information services and systems; practical application of tools and techniques stressed. Prerequisite: departmental consent.

303—Microcomputers in Libraries (3). Introduction to microcomputer configurations, the microcomputer in society and libraries, particularly school and public libraries, administrative uses and problems, public access in libraries, library-specific applications, and planning and budgeting. Prerequisite: departmental consent.

305—Access to Electronic Information (3). Introductory survey for non-library science students to the sources and services available for computerized retrieval. (Includes techniques needed for successful use.) Practical experience with a limited number of data bases provided.

350—Special Readings (cr. arr.). Prerequisite: departmental consent.

400—Problems (cr. arr.). Special problems in information system design and evaluation, for individual directed study. Prerequisites: departmental consent.

401—Library Information Systems (3) An introduction to the use and application of computers in an on-line environment for the design and control of library processes. BASIC is used as a tool for studying text manipulation and file organization. Vendor packages are critiqued and evaluated. Prerequisites: 101 and departmental consent.

410—Seminar in Information Science (1-3). Discussion and critical study of current developments in information science. Prerequisites: 101 and departmental consent.

412—Information Storage and Retrieval (3). Introduces students to those techniques and models which are currently topics of research in information science. Emphasizes techniques useful in an automated environment. Automatic indexing, automatic classification and bibliometrics included. Prerequisite: departmental consent.

413—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.

432—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: 401, Library Science 332, and departmental consent.

441—Information Systems Resource Management (3). Use of bibliometric techniques for management decisions in effective utilization of resources of information systems. Intensive study of selected topics related to library and information center management. Prerequisites: Library Science 341 and departmental consent.

Linguistics

107 Tate Hall (314)882-3582

FACULTY

Donald M. Lance, chairman, professor of English, PhD, University of Texas-Austin

Louanna Furbee, director of graduate studies, professor of anthropology, PhD, University of Chicago

James D. Amerman, professor of communicative disorders, PhD, University of Illinois

Nelson Cowan, associate professor of psychology, PhD, University of Wisconsin-Madison

Magdalena Garcia-Pinto, associate professor of Spanish, PhD, University of Texas-Austin

Daniel E. Gulstad, professor of Spanish, PhD, University of Illinois

Benjamin L. Honeycutt, associate professor of French, PhD, The Ohio State University

Eugene N. Lane, professor of classical studies, PhD, Yale University

Linnea D. Lilja, associate professor of curriculum and instruction, PhD, University of Minnesota

Dorothy Watson, professor of curriculum and instruction, PhD, Wayne State University

Paul Weirich, associate professor of philosophy, PhD, University of California-Los Angeles

C. Gilbert Youmans, associate professor of English, PhD, University of Wisconsin-Madison

DEGREE: MA in linguistics

(Not currently admitting new students.) 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.

A Kay sonograph is available to perform spectrographic analyses of speech.

Financial aid, when available, is arranged through the participating departments.

For further information, write the Director of Graduate Studies, Linguistics Area Program, 200 Swallow Hall, Columbia, Mo. 65211.

MASTER'S DEGREE: To be accepted as an MA candidate, a student must have taken an introductory course in general linguistics. Admission to the program is contingent upon the recommendation of the linguistics faculty. An adviser with appropriate academic interests is selected from the linguistics staff to aid the candidate in planning a program. All candidates must complete with grades of B (A=4.0) or better a core program of five courses in linguistics as prescribed by the linguistics committee. Additional courses may be taken in linguistics or in related areas.

Foreign languages are not required but normally are included in a linguistics program, these needs are determined on an individual basis.

A candidate has an option of two programs of study.

In either program, a student must take 15 hours of 400-level course work and may not take more than 12 hours in readings and research. Either plan culminates in a two-part final examination, a five-hour written portion to be followed within a week by an hour-long oral portion. A candidate in the thesis program also must pass a final examination, either written or oral, covering the research and related topics.

COURSES

201—Topics (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite departmental consent for repetition.

212—Speech Science (3) (same as Communicative Disorders 210).

235—Philosophy and Language (3) (same as Philosophy 235).

260—Phonetics (3) (same as Spanish 260).

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 and Science. Prerequisite: qualification for honors degree.

301—Topics (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: consent of chairman for repetition.

306—Sociolinguistics (3) (same as Anthropology 306).

308—Historical Linguistics (3) (same as Anthropology 308).

309—Topics in Linguistics (3-6) (same as English 309).

311—History of the French Language (3) (same as French 311).

313—History of the Greek and Latin Languages (3) (same as Classical Studies 311).

314—Symbolic Logic (3) (same as Philosophy 314).

315—Language Discourse (3) (same as Communication 315).

319—The Structure of American English (3) (same as English 319).

320—History of the English Language (3) (same as English 320).

322—Regional and Social Dialects of American English (3) (same as English 322).

323—Principles of Teaching English as a Second Language (3) (same as English 323).

346—Language and Culture (3) (same as Anthropology 346).

350—Special Readings (1-3). Independent study through readings, conferences and reports. Prerequisites one linguistics course and instructor's consent.

361—History of the Spanish Language (3) (same as Spanish 361).

372—Techniques in Linguistic Analysis (3) (same as Anthropology 372 and Romance Languages 372).

378—Structure of Modern French (3) (same as French 378).

379—Structure of Modern Spanish (3) (same as Spanish 379).

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 (cr. arr.). Independent study through readings, analysis of special linguistic problems and reports. Prerequisites: one advanced linguistics course and instructor's consent.

411—Physiological Phonetics (3) (same as Communicative Disorders 411).

417—Studies in the English Language (3) (same as English 417).

418—Introduction to Old English (3) (same as English 418 and German 418).

446—Seminar in Anthropological Linguistics (3) (same as Anthropology 446).

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 and instructor's consent for repetition.

490—Research in Linguistics (cr. arr.).

Library and Informational Science

Management

College of Business and Public Administration
214 Middlebush (314)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. 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: junior standing.

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, and administrative regulation of business and consumer issues. Prerequisite: junior standing.

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.

300—Problems (cr. arr.).

308—Operations Management (3). Managerial analysis of operating problems, with emphasis on planning and control systems. Prerequisite: 202 or instructor's consent.

310—Personnel Management (3). Manpower policies and procedures of business enterprise. Prerequisite: 202 or instructor's consent.

311—Collective Bargaining (3). Content, negotiation, administration of collective labor agreements and settlement of disputes. Prerequisites: 310 and junior standing or instructor's consent.

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 and individual industrial field studies. Prerequisite: 308 or instructor's consent.

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 and management problems in application. Prerequisite: 318.

320—Personnel Administration Law (3). Analysis and evaluation of legal and administrative regulations of terms of employment, Fair Labor Standards, discriminatory practices, safety, health and other regulations. Prerequisites: 310 and senior standing, or instructor's consent.

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. Prerequisite: 202 or instructor's consent.

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 or instructor's consent.

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). Selected operations management topics applications of operations concepts, techniques and methodologies applied to service sector organizations — hospitals, government agencies, schools, banks. Focus on designing, planning and controlling service operations. Prerequisite: 308 or instructor's consent.

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 Personnel 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 and advanced techniques. Prerequisite: 310 or instructor's consent.

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 estate. Prerequisite: 254.

360—Venture Management (3). Analytical study of the requirements in starting and initially operating a new business organization. Lectures, readings, case studies and individual or team projects. Prerequisites: 202, junior standing or instructor's consent.

375—Management Policies and Problems (3). Enterprise-level case studies, simulations, similar exercises to integrate business functional decisions and assessment of environmental influences on business. Development and implementation of company strategies. Prerequisites: 202 and senior standing (B&PA) or instructor's consent.

380—Statistical Forecasting (3) (same as Finance 380, Marketing 380 and Statistics 380). Examines statistical theory and techniques used in forecasting. Prerequisites: Statistics 234 and Statistics 250.

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, 330 or instructor's consent.

400—Problems (cr. arr.). Graduate students may select topics for study and investigation.

405—Seminar in Management (cr. arr.). Intensive studies of current research and issues. Readings, independent investigations and reports. Prerequisite: open to PhD students, or instructor's consent.

418—Business and Economic Research (3) (same as Finance 418 and Marketing 418).

435—Topics in Management (3). Selected current topics in management. Prerequisite: instructor's consent.

436—Advanced Personnel Management (3). Analysis of research and practice in planning for attracting, selecting, developing and disciplining employees at work. Prerequisite: Business Administration 301 or instructor's consent.

437—Management of Labor Relations (3). Managerial approaches to collective bargaining. Negotiation, grievances, agreement administration and emphasis on recent developments.

438—Organizational Behavior and Group Dynamics (3). Organizational and business applications of theory and research in individual differences, interpersonal relations and small group dynamics. Prerequisites: 329, Business Administration 301 or instructor's consent.

439—Organizational Theory and Design (3). Organizational design, relationships to technical, cultural and environmental factors and problems of affecting change. Prerequisites: 330, Business Administration 301 or instructor's consent.

441—Information Requirements Analysis (3). Conceptual tools and techniques for analyzing and designing computer-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. Prerequisite: Business Administration 320 or instructor's consent.

442—Decision Support Systems (3). An examination of the role of Decision Support Systems (DSS) in organizations from a theoretical and applied viewpoint. The components of the data base, model base and the user system interface are applied in the context of both the mainframe and microcomputer. Prerequisite: Business Administration 326 or instructor's consent.

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. Prerequisite: Business Administration 320 or instructor's consent.

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 system and corporate-level MIS effectiveness. Prerequisites: Business Administration 320 and two additional courses beyond programming, or instructor's consent.

446—Operations Planning (3). Emphasizes operations planning and design. Selected topics in planning aggregate output, location, layout, capacity, maintenance, equipment replacement, use of improvement curves and long-term forecasting. Cases, lecture, simulation and projects. Prerequisites: Business Administration 324 and 342 or instructor's consent.

447—Operations Scheduling and Control (3). Topics selected from job-shop scheduling, project scheduling, line balancing, reliability, MRP, short-term forecasting, inventory, quality and cost control, and measurement. Cases, lecture, simulation and projects. Prerequisites: Business Administration 324 and 342 or instructor's consent.

448—Operations Policy (3). Cases dealing with operations policy within selected manufacturing and service industries and firms. Analysis as a basis of policy is stressed. Prerequisites: Business Administration 342 or instructor's consent.

480—Current Topics Seminar in Management (1-3). Reading and critical evaluation of selected current management literature and research. May be repeated. Prerequisite: PhD students only.

490—Research (cr. arr.). Thesis research for PhD degree.

Marketing

College of Business and Public Administration
214 Middlebush (314)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. Program information and requirements are given under **Business Administration.**

COURSES

204—Principles of Marketing (3). Institutions, processes and problems involved in transferring goods and services from producer to consumers, with emphasis on economics and social aspects. Prerequisites: Economics 51 and junior standing.

206—Distribution Systems (3). Analysis of physical distribution function in marketing, with emphasis on transportation, warehousing, materials handling and facility location as elements of an integrated system. Prerequisites: Economics 51 and junior standing.

300—Problems (cr. arr.).

309—Marketing Management (3). Analysis of the broad range of managerial marketing issues of relevance to modern business firms. May not be used in meeting the marketing or logistics curricula requirements. Prerequisites: 204 and junior standing.

313—Marketing Research (3). Examines procedures for defining problems, specifying information requirements, and 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 sociopsychological influences on consumer market and buying behavior. Prerequisites: 204 and junior standing.

335—Management of Promotion (3). The promotion function and 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 saleswomen, and field sales managers, with emphasis on underlying behavioral and quantitative theory. Prerequisites: 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 and regulation by government. Prerequisites: 204 and junior standing.

355—Contemporary Issues in Marketing (3). Intensive study of selected issues in marketing. Prerequisite: six hours of marketing.

358—Purchasing (3). Organization and functions of purchasing departments with particular emphasis on industrial purchasing. Prerequisites: Management 202 and six hours of 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: 206 and junior standing.

380—Statistical Forecasting (3) (same as Management 380, Finance 380 and Statistics 380).

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:

206 and junior standing.

400—Problems (cr. arr.). 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.

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.

444—Advanced Consumer Behavior (3). Basic factors influencing consumer decision making. Attention given to psychological, sociological and economic variables motivation, attitude, learning, personality, small group, social class, demographic factors, culture; analyzes their effects on consumer decision-making process.

465—Marketing Strategy (3). Theory of determining marketing strategy by business firms and organizations.

466—Quantitative Methods for Marketing (3). Examines and appraises use of quantitative tools of analysis in solving marketing problems.

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.

470—International Marketing (3). Examination of competition and market structure abroad including common market and trade bloc arrangements.

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.

480—Current Topics Seminar in Marketing (1-3). Reading and critical evaluation of selected current marketing literature and research. May be repeated. Prerequisite: PhD students only.

490—Research (cr. arr.). Thesis research for PhD degree.

Materials Science

424 Physics Building (314)882-6086

FACULTY

Aaron D. Krawitz, chairman, professor of mechanical and aerospace engineering, PhD, Northwestern University

H. R. Chadrasekhar, professor of physics, PhD, Purdue University

Meera Chandrasekhar, professor of physics, PhD, Brown University

Earl J. Charlson, professor of electrical and computer engineering, PhD, Carnegie-Mellon University

Jon M. Meese, professor of electrical and computer engineering, PhD, Purdue University

Patricia L. M. Plummer, professor of physics, PhD, University of Texas

Paul W. Schmidt, professor of physics, PhD, University of Wisconsin

Haskell Taub, professor of physics, PhD, Cornell 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, Missouri University Research Reactor and adjunct professor of physics, PhD, Carnegie-Mellon University

Ronald R. Berliner, Missouri University Research Reactor and adjunct associate professor of physics, PhD, University of Illinois

Elaine M. Charlson, associate professor of electrical and computer engineering, PhD, University of Missouri-Columbia

Uee W. Cho, associate professor of mechanical and aerospace engineering, PhD, Brown University

Boualem Hammouda, Missouri University Research Reactor and adjunct associate professor of physics, PhD, University of Michigan

Frederick K. Ross, Missouri University Research Reactor and adjunct associate professor of chemistry, PhD, University of Illinois

Edward H. Conrad, assistant professor of physics, PhD, University of Wisconsin

V. S. Gopalaratnam, assistant professor of civil engineering, PhD, Northwestern University

Sashi Satpathy, assistant professor of physics, PhD, University of Illinois

Giovanni Vignale, assistant professor of physics, 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 of the 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 chairman and the director of graduate studies in the major department. A set of courses from chemical engineering, civil engineering, electrical and computer engineering, geology, mechanical and aerospace engineering and physics comprises the instructional body to the minor.

MS DEGREE 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.

PhD 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 Math Sciences Bldg (314)882-6221

FACULTY

L. Jerome Lange, chairman, professor, PhD, University of Colorado

Mark S. Ashbaugh, director of graduate studies, associate professor, PhD, Princeton University

Calvin D. Ahlbrandt, professor, PhD, University of Oklahoma

John K. Beem, professor, PhD, University of Southern California

Peter G. Cassaza, professor, PhD, University of Iowa

Carmen C. Chicone, professor, PhD, University of Wisconsin

Friedrich Gesztesy, professor, PhD, University of Graz

James A. Huckaba, professor, PhD, University of Iowa

Marc Q. Jacobs, professor, PhD, University of Oklahoma

Nigel J. Kalton, professor, PhD, Cambridge University

Ira J. Papick, professor, PhD, Rutgers University

Dix Pettey, professor, PhD, University of Utah

Clinton M. Petty, professor, PhD, University of Southern California

Elias Saab, professor, PhD, University of Illinois-Champaign/Urbana

Paulette Saab, professor, PhD, University of Illinois-Champaign/Urbana

Keith W. Schrader, professor, PhD, University of Nebraska

F. Dennis Sentilles, professor, PhD, Louisiana State University

W. Roy Utz, professor emeritus, PhD, University of Virginia

Joe Zemmer, professor emeritus, PhD, University of Wisconsin

Zhongxin Zhao, professor, PhD, Fudan University

Robert P. Carmignani, associate professor, PhD, Rice University

Richard Crownover, associate professor, PhD, Louisiana State University

John H. Reeder, associate professor, PhD, Northwestern University

Nakhle Asmar, assistant professor, PhD, University of Washington

Steven D. Cutkosky, assistant professor, PhD, Brandeis University

Adam Helfer, assistant professor, PhD, Oxford University

Guan-Hsong Hsu, assistant professor, PhD, Courant Institute

Steven Montgomery-Smith, assistant professor, PhD, Cambridge University

Ronald Morgan, assistant professor, PhD, University of Texas

Sotirios Notaris, assistant professor, PhD, Purdue University

Jan Segert, assistant professor, PhD, Princeton University

Hema Srinivasan, assistant professor, PhD, Brandeis University

Dana Weston, assistant professor, PhD, University of Illinois

DEGREES: MS in applied mathematics and MA, MST and PhD in mathematics

INTERDISCIPLINARY AREA PROGRAM: 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 50 graduate students, of whom one-third are post-master's, are currently in the department; nearly all are supported by graduate

teaching assistantships. Students considered eligible for fellowships may be asked to submit more detailed information about their qualifications.

MASTER OF ARTS: The requirements for the MA degree include the satisfactory completion of 30 hours of approved course work, of which at least 18 hours must be 400 level. The courses Math 404 Theory of Functions of Real Variables I, Math 413 Complex Analysis I, Math 432 Algebra I, and Math 468 General Topology I are required for the degree. Students are expected to make up any deficiencies in their undergraduate training in advanced calculus and abstract algebra, and may list on their graduate program no more than two of the courses Math 310, Math 311, Math 340 and Math 341. A written comprehensive examination is given in the final semester covering the material in the courses mentioned. An additional oral examination may be required in some circumstances. A student is required to write an independent project that can take several forms, including creative mathematics, historical exposition or other special projects.

THE MASTER OF SCIENCE FOR TEACHERS: This degree is designed primarily for those who want to teach mathematics at the secondary-school level. It is designed to give the student a broad background in mathematics but it does not require the depth of study needed in the MA program. Courses in other fields, such as statistics and computer science, may be included as part of the program. A candidate for the degree must be certified to teach high-school mathematics before completing the degree. Requirements include 30 hours of course work, of which at least one course must be numbered above 400. At least two courses in each of the fields of algebra, analysis and geometry (including topology) must be included in the program. Comprehensive written and oral examinations are given near the end of the program. A student is required to write an independent project that can take several forms, including creative mathematics, historical exposition or other special projects.

THE MASTER OF SCIENCE IN APPLIED MATHEMATICS: This degree 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. Credit for Math 304 will not count toward the 30 hours. At least four 400-level courses must be taken in the Department of Mathematics and at least three approved courses outside the department. Math 404 Theory of Functions of Real Variables I, Math 408 Partial Differential Equations, Math 413 Complex Analysis I, and Math 426 Advanced Ordinary Differential Equations are required courses. 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 of the areas of linear algebra, numerical analysis, and mathematical statistics or probability. The candidate must pass a written examination over advanced calculus, real and complex analysis, linear algebra, and differential equations. In some cases, an oral examination also may be required. A student is required to write an independent project that can take several forms, including creative mathematics, historical exposition or other special projects.

THE DOCTOR OF PHILOSOPHY: The doctor of philosophy degree 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 shortly 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, mathematical physics, numerical analysis, probabilistic analysis and topology.

COURSES

201—Calculus III (3). Vectors, solid analytic geometry and calculus of several variables. Prerequisite: grade of C or better in 175 or equivalent training.

205—Calculus for Business and 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. Prerequisite: 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: 175 and the ability to program in a high-level language such as Fortran, Pascal, or C.

250—Survey of Mathematics (3). Selected topics from fundamental concepts of algebra, geometry, mathematical logic, history of mathematics. Recommended for students who plan to teach secondary school mathematics. Prerequisite: 175.

301—Topics (cr. arr.). 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 and uniform convergence and 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 and linear systems. Prerequisite: 201.

305—Introduction to Complex Variables (3). Complex functions, contour integration, power series, residues and poles and conformal mapping. Prerequisite: 302 or 310.

309—Applied Analysis (3). Green's functions, systems of differential equations, Fourier series and integrals, Laplace transforms and their inversion using residues. Methods of partial differential equations. Eigen-function expansions, Sturm-Liouville problems and Bessel's equation. 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 and 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 and integration theory. Prerequisite: 310 or equivalent.

320—Introduction to Mathematical Statistics (3) (same as Statistics 320). Introduction to theory of probability and statistics using concepts and methods of calculus. Prerequisite: 201 or instructor's consent.

323—Numerical Analysis (3) (same as Computer Science 323). Solutions of equations and systems of equations, interpolation and approximation, numerical differentiation and integration, and numerical solutions of differential equations. Selected algorithms programmed for solution on computers. Prerequisites: 201 and the ability to program in a high-level language such as Fortran, Pascal, or C.

324—Numerical Linear Algebra (3) (same as Computer Science 324). 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 high-level language such as Fortran, Pascal, or C; recommended 331.

325—Introduction to Probability Theory (3) (same as Statistics 325). Probability spaces, random variables and their distributions, repeated trials, probability limit theorems. Prerequisite: 201 or instructor's consent.

326—Statistical Inference I (3) (same as Statistics 326). Sampling, point estimation, sampling distribution, tests of hypotheses, regression and linear hypotheses. Prerequisite: 325.

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 and introduction to Ramsey theory. Prerequisite: 226 or instructor's consent.

330—Theory of Equations (3). Study of polynomials and their zeros, elementary determinant and matrix theory. Prerequisite: 201 or 226.

331—Matrix Theory (3). Basic properties of matrices, vector spaces and determinants with some emphasis on applications. Prerequisite: 201 or 226.

332—Linear Programming (3). Linear dependence and rank in vector spaces in Rn, Farkas' Lemma, Polyhedral Decomposition. Strong duality and complementarity theorems. The simplex method, revised simplex and sensitivity analysis. Primal dual simplex method and network simplex methods. Computational complexity and Karmarkars algorithm. Prerequisite: 324 or 331 or instructor's consent.

333—Higher Algebra (3). Introduction to rings, integral domains, fields and groups. Prerequisite: 201 or 226.

335—Theory of Numbers (3). Factorization, Euler phi-function, congruences and primitive roots. Prerequisite: 201 or 226.

337—Applied Modern Algebra (3) (same as Computer Science 337). Introduction to modern algebra with emphasis on applications to computer science, engineering and 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.

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.

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: 201.

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.

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.

408—Partial Differential Equations (3). Sturm-Liouville problems and orthogonal functions. Solutions of partial differential equations by separation of variables and integral transforms. Properties of hyperbolic, elliptic and parabolic equations. Prerequisites: 304 and either 302 or 310.

409—Functional Analysis I (3). Linear topological spaces, Banach spaces and Hilbert spaces. Operator theory, including the Hahn-Banach, uniform boundedness and closed graph theorems. Prerequisites: 311 and consent, or 404.

410—Functional Analysis II (3). Topological vector spaces, duality theory and Banach algebras. Prerequisite: 409.

412—Calculus of Variations I (3). Development of necessary conditions and of sufficient conditions for nonparametric and parametric problems. Hamilton's principle and 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 and selected topics. Prerequisite: 413.

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.

423—Advanced Numerical Analysis (3). Elimination and iterative methods for solving linear systems of equations. Finite difference approximations to linear partial differential equations, integral equations and boundary value problems for ordinary differential equations. Error analyses. Prerequisites: 310, 323 or equivalent and 331.

424—Theoretical Numerical Analysis (3). Theories of interpolation and approximation, iteration and other aspects of numerical analysis. Prerequisites: 302 or 310, 331 or 324 and instructor's consent.

425—Special Functions (3). Representations and properties of the gamma, beta, Gauss hypergeometric, confluent hypergeometric, Legendre, elliptic, Bessel, Laguere, Hermite, Jacobi, ultraspherical and related functions. Prerequisite: 305.

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.

429—Topics in Analysis (cr. arr.). Advanced topics in analysis. Prerequisite: instructor's consent.

432—Algebra I (3). Theory of algebraic structures—groups, rings, fields, algebraic and transcendental extensions of fields. Prerequisites: 340 and 341, or equivalent.

433—Algebra II (3). Theory of modules, Galois theroy and additional topics to be selected by the instructor. Prerequisite: 432 or equivalent.

434—Topics in Algebra (3). Advanced topics in field theory and commutative and non-commutative ring theory. Prerequisite: 432.

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, 406, or instructor's consent.

441—Stochastic Processes (3) (same as Statistics 441). Markov processes, martingales, orthogonal sequences, processes with independent and orthogonal increments, stationarity and linear prediction. Prerequisite: 440.

445—Advanced Mathematics for the Physical Sciences (3). Study of selection of topics in quantum mechanics and statistical mechanics. Schrodinger operators and their self-adjointness. Semi-classical methods and their application to estimation of eigenvalues. Partition functions in many body problems and methods of estimation. Prerequisites: instructor's consent, Mathematics 302, 310 or Physics 446 recommended.

449—Topics in Applied Mathematics (cr. arr.). 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 and numerical analysis.

457—Differential Geometry for Scientists and Engineers (3). Tensors and multilinear forms. Connections, covariant differentiation, geodesics and curvature on Riemannian and pseudoRiemannian manifolds. Applications to special relativity and general relativity. Prerequisites: 302 and some knowledge of Matrix Theory.

460—Topics of Geometry (cr. arr.). 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.

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 with reference to other homology and cohomology theories. Introduction to homological algebra. Prerequisite: 468.

479—Topics in Topology (cr. arr.). Advanced topics in topology or topological algebra.

480—Analysis Seminar (cr. arr.).

482—Algebra Seminar (cr. arr.).

484—Geometry Seminar (cr. arr.).

486—Topology Seminar (cr. arr.).

488—Applied Mathematics Seminar (cr. arr.).

489—Master's Project (3). Students will be required to complete an independent thesis. Topics are chosen in consultation with a faculty adviser and are subject to departmental approval.

490—Research (cr. arr.).

Mechanical and Aerospace Engineering

College of Engineering
1006 Engineering Building (314)882-2785

FACULTY

Richard C. Warder Jr., chairman, director of graduate studies, professor, PhD, Northwestern University

Paul W. Braisted, professor, PhD, Stanford University

William L. Carson, professor, PhD, University of Iowa

Donald L. Creighton, professor, PhD, University of Arizona

Roger C. Duffield, professor, PhD, University of Kansas

Sam D. Haddad, professor, PhD, University of Southampton, England

Aaron D. Krawitz, professor, PhD, Northwestern University

John C. Lysen, professor, PhD, Iowa State University

John B. Miles, professor, PhD, University of Illinois

Oran A. Pringle, professor, PhD, University of Wisconsin

David E. Wollersheim, professor, PhD, University of Illinois

C. Quinton Bowles, associate professor, PhD, University of Delft

Gaylord H. Bunch, associate professor, MS, University of Missouri-Columbia

Uee Wan Cho, associate professor, PhD, Brown University

Bhaskar S. Majumdar, associate professor, PhD, University of Rochester

Andrzaj G. Nalecz, associate professor, PhD, Polish Academy of Science

Donald R. Smith, associate professor, PhD, University of Colorado

William E. Stewart, associate professor, PhD, University of Missouri-Rolla

Bryan R. Becker, assistant professor, PhD, University of Tennessee

Ahmed S. El-Gizawy, assistant professor, PhD, University of Waterloo

Mohamed M. El-sayed, assistant professor, PhD, Wayne State University

Woon-Sung Lee, assistant professor, PhD, University of Iowa

Satish S. Nair, assistant professor, PhD, Ohio State University

Steven P. Neal, assistant professor, PhD, Iowa State University

Thomas A. Phelps, assistant professor, PhD, University of Wisconsin

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 acoustics, aerosol mechanics,

biomechanics, controls, design, heat transfer, i.c. engines, lasers, manufacturing, materials science, particulate systems, solid mechanics, thermal systems, thermodynamics, transportation and vehicle dynamics. The proximity of the MU School of Medicine and College of Veterinary Medicine offers the opportunity for interdisciplinary research and study in the field of bioengineering.

The department has a number of specialized laboratories in the areas of interactive computer graphics, heat transfer and fluid mechanics, material science, design optimization, aerosol mechanics, digital controls, creep and fracture mechanics and system dynamics.

In addition to the usual modern instrumentation and equipment normally found in mechanical and aerospace engineering laboratories, the department utilizes a number of special facilities, including MTS and Instron material and structural test equipment, wind tunnels, X-ray and electron microscope equipment, microprocessor development systems, electrohydraulic and electrodynamic vibration equipment and the largest university research reactor in the United States. The University and the College of Engineering have an extensive computer system consisting of Amdal mainframe computers and DEC super-minicomputers. Complimenting these computer systems is an array of Megatek and Lexidata high-resolution graphics terminals housed within the department. Students also have access to clusters of departmental and college mini and personal computers. The department currently has support for about two-thirds of its graduate students in the form of fellowships and research and teaching assistantships. Consideration of applications for financial support begins on February 15 of each year.

Application forms and further information about the department can be obtained by writing the Director of Graduate Studies, Department of Mechanical and Aerospace Engineering, 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.

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 (Problems) 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. All applicants are required to take the GRE examination.

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.

In addition to course work in engineering, a student's program will include additional mathematics and basic science courses. Proficiency in reading one pertinent foreign language, a special research technique or a collateral field is required for the PhD degree. The customary foreign language is German or French, however, for a good cause, an appropriate substitution can be made. Alternatively, a special research technique or a collateral field can be substituted for the language.

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 appointed by the dean of the Graduate School upon the department's recommendation.

A qualifying examination, consisting of written and oral questions, is given soon after the student begins doctoral study. It is administered by a committee of five people approved by the department. When previously arranged, the MS final examination can be administered so that it also serves as the PhD qualifying examination. Successful completion of this examination is a prerequisite to formal acceptance into the PhD program. 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.

COURSES

201—Topics in Mechanical and Aerospace Engineering (3). Current and new technical developments in mechanical and aerospace engineering. Prerequisite: instructor's consent.

206—Computer-Aided Design in Mechanical Engineering (3). Application to computer aided design principles toward the generation, analysis, synthesis and optimization of realistic engineering components and systems. Prerequisite: Engineering 5. Co-requisite: Mathematics 304 or equivalent.

209—Engineering Thermodynamics II (3). Gas and vapor mixtures, cycles, availability, imperfect gases, thermodynamic relations, combustion and chemical equilibrium. Prerequisites: Engineering 99 and 206 concurrently.

224—Engineering Materials I (3). A first course in materials science and engineering. The nature of the structure of engineering materials and its relationship to physical properties. Prerequisites: Engineering 85 and 99 or equivalent.

234—Engineering Materials II (3). Mechanical behavior of engineering materials. Fundamental response of materials to mechanical treatment in engineering designs. Prerequisites: 224 and Engineering 195.

251UFluid Mechanics (3) (same as Civil Engineering 251). Concepts of statics and dynamics of fluids, with emphasis on principles of continuity, momentum and energy. Boundary layers, dimensional analysis and drag are covered briefly. Thorough treatment of pipe flow. Prerequisites: 185 and Engineering 99 concurrently.

252—Instrumentation and Measurements Laboratory I (3). Static and dynamic errors, experiment design, instrumentation selection and calibration, measurement of voltage, resistance, amperage, duration, frequency, displacement, velocity, acceleration, strain, force and torque. Prerequisites: 185, Engineering 195, Mathematics 304 and Engineering 124 or concurrently.

256—Design of Machine Elements (4). Methodology of engineering design. Design and selection of mechanical elements to meet functional, environmental and manufacturing requirements. Case studies. Prerequisites: 185, Engineering 30 and 234 concurrent.

261—Thermodynamics of Compressible Flow (3). One dimensional compressible flow with and without friction and heat transfer. Isentropic flow and shock phenomenon in nozzles and diffusers. Topics from flow measurement and propulsion. Prerequisites: 251 and Mathematics 304.

262—Instrumentation and Measurements Laboratory II (3). Continuation of 252 with emphasis on instruments to measure temperature, pressure, fluid flow, fluid velocity, sound, spectral content and emissions. Prerequisites: 251 and 252.

271—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: 251 and Mathematics 304.

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, practicum and experimentation in machine tool applications. Prerequisite: 224.

285—Systems Dynamics (3). Three-dimensional rigid body dynamics, mechanical vibration, response, control and stability of mechanical systems. Prerequisites: 185 and Mathematics 304.

296—Design Synthesis (3). Synthesis procedures in mechanical and aerospace design, physical, economic and manufacturing constraints, modeling, optimization. design case studies from industry and design projects. Prerequisite: 256.

299—Heat Transfer (3). Fundamentals of conduction, convection and radiation. Use of non dimensional parameters. Theory of heat exchangers. Prerequisites: 251, Mathematics 304 and 206 concurrently.

300—Problems (cr. arr.). Special design, experimental and analytical problems in mechanical and aerospace engineering. Prerequisite: senior standing in mechanical and 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). Review of manufacturing methods in terms of economics and processable materials. Analysis of metal forming processes. Prerequisite: 224.

304—Digital Computer Applications in Engineering (3) (same as Chemical Engineering 304, Electrical and Computer Engineering 304 and Nuclear Engineering 304).

306—Analysis of Mechanisms (4). Kinematic and dynamic bearing force, shaking force and time response analysis of mechanisms and robot linkages, graphical, analytical and computer assisted techniques. Prerequisites: 206, 185 and Civil Engineering 185.

314—Material Science for Advanced Applications (3). Study of the physical and mechanical metallurgy of alloy systems of interest in engineering applications. Prerequisite: 234.

315—Engineering Evaluation of Energy Systems and Resources (3) (same as Electrical and Computer Engineering 315 and Nuclear Engineering 315).

321—Creativity in Design (3). Identification and strengthening of attitudes and talents essential in design. Creative aspects and value considerations in design. Prerequisite: senior or graduate standing in engineering.

324—Non-Metallic Engineering Materials (3). Structures, properties and applications of ceramics, glasses, cermets, polymers and composite materials. Prerequisite: 334.

326—Synthesis of Linkages (3). Type, number and dimensional synthesis of linkages to produce a given input-output motion or force. Prerequisites: 185 and 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 and 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.

339—Solar Energy Utilization (3). Thermal aspects of solar radiation applied to human and industrial needs. Solar energy availability hourly, daily and seasonally. Space and water heating. Thermal storage. Passive and active solar design of buildings and homes. Prerequisite: 299.

340—Heating and Air Conditioning (3). General principles of thermodynamics, heat transfer and fluid dynamics are used to determine how to calculate building loads, size equipment and ducts and evaluate system performance in maximizing human comfort. Prerequisite: 299.

344—Composite Materials (3). Survey of composite materials used in engineering. Emphasizes fiber-reinforced composites but includes laminate and particulate composites. Prerequisite: 234 or equivalent.

346—Introduction to Nuclear Reactor Engineering I (3) (same as Nuclear Engineering 346). Nuclear reactions and radiations, neutron diffusion and slowing down, steady-state and time dependent theory, reactor control and energy removal. Prerequisites: Mathematics 304 or instructor's consent.

350—Honors Research (cr. arr.). Independent investigation to be presented as an undergraduate honors thesis. Prerequisite: honors student in mechanical and aerospace engineering.

351—Power Plant System Design (3). Preliminary component and system design. Optimum design of boilers, steam turbines, condensers, 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).

353—Experimental Stress Analysis (3) (same as Civil Engineering 353).

356—Digital Control of Mechanical Systems (3). Laboratory application of digital devices to the control of thermal, fluid and mechanical systems. Includes interfacing circuitry, gate and relay logic, microprocessor control. Extensive practical laboratory sessions on an individual basis Prerequisites: Engineering 124 and Engineering 126 or instructor's consent.

357—Automatic Control of Mechanical Systems (3). Basic study of controller characteristics, and feedback elements, process characteristics and analysis of complete systems. Prerequisite: 285 or equivalent.

360—Internal Combustion Engines (3). Gas and oil engines. Thermodynamics of ideal and actual cycles, fuels and combustion, carburetor and injection systems, performance and construction. Prerequisite: 251.

363—Aerospace Propulsion (3). Analysis of aircraft engines and spacecraft propulsion systems. Prerequisites: 251 and 209.

365—Automotive Engineering (3). Principles of design, construction and operating characteristics of automotive vehicles. Selected design problems and review of current developments. Prerequisite: 256 or concurrently.

366—Applied Mechanical Optimization (3). Introduction to mathematical programming techniques and applications to the design of mechanical systems and components. Prerequisite: 206.

369—Principles of Direct Energy Conversion (3) (same as Electrical and Computer Engineering 369). Principles and utilization of thermoelectric, therminonic, photovoltaic, magnetohydrodynamic generators and fuel cells. Prerequisites: 209 and 251 or equivalent.

371—Applied Robotics in Production (3) (same as Industrial Engineering 371).

372—Integrated Production Systems (3) (same as Industrial Engineering 372).

379—Particulate Systems Engineering (3) (same as Chemical Engineering 379 and Nuclear Engineering 379). An introduction to natural and engineered particulate systems. Prerequisite: 299 or Chemical Engineering 234 or equivalent.

382—Lasers and Their Applications (3) (same as Electrical and Computer Engineering 382 and 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).

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: 185 and Engineering 195.

389—Advanced Thermodynamics (3). Topics from First and Second Laws, thermodynamic relationships and equations of state of pure substances and mixtures. Computation of properties. Prerequisite: 209.

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). Applications involving more than one mode of heat transfer. Numerical solution of transient heat flow. Heat transfer with change of phase. Heat exchangers. Heat transfer in high speed flow. Mass transfer. Prerequisite: 299.

400—Problems (cr. arr.). 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 Process Design (3). Machine and component selection in the determination of optimum manufacturing systems. Physical embodiment of manufacturing systems. Characteristics of ideal manufacturing systems. Prerequisites: 303, Business Administration 342 or equivalent.

404—Advanced Metallurgy Principles (3). Advanced treatment of physical metallurgy principles to provide a theoretical understanding of engineering materials. Prerequisite: 244 or equivalent.

408—State Variable Methods in Automatic Control (3) (same as Chemical Engineering 408, Electrical and Computer Engineering 408 and Nuclear Engineering 408).

410—Seminar (1). Reviews recent investigations and projects of major importance in mechanical and aerospace engineering.

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).

416—Theory of Plasticity (3) (same as Civil Engineering 416).

418—Advanced Dynamics (3) (same as Civil Engineering 418).

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: instructor's consent.

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 and subcritical flaw growth. Prerequisites: 224, 244 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 and 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 and 304.

438—Introduction to Turbulence (3). Introduction to the physical phenomena of turbulence, supported by mathematical and statistical descriptions. Especially appropriate for engineers involved in research aspects of momentum, heat and mass transport. Prerequisite: 430 or instructor's consent.

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.

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.

459—Dynamics of Structures (3) (same as Civil Engineering 459).

460—Combustion (3). Study of advanced topics in flames and combustion. Detonation and deflagrations, supersonic combustion and air pollution. Prerequisites: 209 and 261.

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. Prerequisite: 386 or Civil Engineering 375.

490—Research (cr. arr.). Independent investigation in field of mechanical and aerospace engineering to be presented as a thesis.

Medieval and Renaissance Studies

128 Arts and Science Building (314)882-3271

FACULTY

M. Bonner Mitchell, chairman, professor of French and Italian, PhD, The Ohio State University

Donald K. Anderson Jr., professor of English, PhD,

Duke University
Robert M. Bender, professor of English, PhD, University of Michigan
William R. Bondeson, professor of philosophy, PhD, University of Chicago
Thomas D. Cooke, professor of English, PhD, University of Pittsburgh
John Foley, professor of English, PhD, University of Massachusetts-Amherst
Daniel E. Gulstad, professor of Spanish, PhD, University of Illinois
C. Haskell Hinnant, professor of English, PhD, Columbia University
James V. Holleran, professor of English, PhD, Louisiana State University
Charles G. Nauert Jr., professor of history, PhD, University of Illinois
Osmund Overby, professor of art history, PhD, Yale University
Ellie Ragland-Sullivan, 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
Margaret P. Sommers, professor of French, PhD, Stanford University
Russell Zguta, professor of history, PhD, Pennsylvania State University
Edzard Baumann, associate professor of art history, PhD, University of Vienna
Martin Camargo, associate professor of English, PhD, University of Illinois
Ben L. Honeycutt, associate professor of French, PhD, The Ohio State University
Norman Land, associate professor of art history, PhD, University of Virginia
A. Mark Smith, associate professor of history, PhD, University of Wisconsin
Marcus Rautman, assistant professor of art history and archaeology, PhD, Indiana University
Steven Suppan, assistant professor of Spanish, PhD, University of Minnesota

The staff of the Medieval and Renaissance studies program is composed of faculty members from the departments of art history, classical studies, English, germanic and slavic studies, history, music, philosophy 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 a number of appropriate courses outside the department, as well as 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.

DEGREE 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 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).

Microbiology Area Program

The administrative responsibility for the Microbiology Area Program resides with the Department of Veterinary Microbiology in the College of Veterinary Medicine. The requirements for this degree program are described under **Doctoral Degree** for the Department of Veterinary Microbiology.

Molecular Microbiology and Immunology

School of Medicine
M642 Medical Sciences Building (314)882-8152

FACULTY

Richard A. Finkelstein, chairman, professor, PhD, University of Texas
Mark A. McIntosh, director of graduate studies, associate professor, PhD, University of Texas
Michael L. Misfeldt, director of graduate student admissions, associate professor, PhD, University of Iowa
James T. Barrett, professor, PhD, University of Iowa
Helen Braley-Mullen, professor, PhD, Purdue University
Olen R. Brown, professor, PhD, University of Oklahoma
Abraham Eisenstark, professor emeritus, PhD, University of Illinois
Frank B. Engley Jr., professor emeritus, PhD, University of Pennsylvania
Herbert S. Goldberg, professor, PhD, The Ohio State University
Ramareddy V. Guntaka, professor, PhD, Kansas State University
Charlotte D. Parker, professor, PhD, University of California-Los Angeles
Kim S. Wise, professor, PhD, University of Southern California
Gordon D. Christensen, associate professor, MD, Creighton University
Michael S. Cooperstock, associate professor, MD, University of Michigan
Theodore J. Green, associate professor, PhD, Ohio State University
David J. Pintel, associate professor, PhD, University of Illinois- Chicago
Hammond G. Riggs Jr., associate professor, PhD, University of Texas Southwestern Medical School
W. Andrew Simpson Jr., associate professor, PhD, University of Tennessee-Memphis
Karen L. Bennett, assistant professor, PhD, Roswell Park Memorial Institute, State University of New York-Buffalo
John F. Cannon, assistant professor, PhD, University of Wisconsin-Madison
David E. Lafrenz, assistant professor, PhD, University of Iowa
David R. Lee, assistant professor, PhD, University of Virginia
Hattie D. Gresham, assistant professor, PhD, Vanderbilt University
Gregory A. McDonald, assistant professor, PhD, University of Virginia

DEGREES: MS and PhD in microbiology

COOPERATIVE DEGREES: MD and PhD in microbiology

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, research institutes, public health and hospital laboratories. The PhD degree is offered only to students who demonstrate a high level of specialized knowledge and clear evidence of research potential. The master of science (MS) program requires about two years of advanced study culminating in a research thesis under the supervision of the student's adviser.

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, plus at least one advanced course), 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 30 hours of graduate study, 16 of which must be in courses at the 400 level. The 30 hours of graduate credit are composed of the following 301 (five hours), 403 (two hours), 410 (a maximum of four hours toward the required 30 hours), 400/490 (seven hours) and other departmental or interdisciplinary courses (12 hours).

It is strongly recommended that new students enroll in a biochemistry course during their first semester as a graduate student in the department.

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 which 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 which tests the student's ability to research and develop an original scientific hypothesis
- a demonstration of research and writing ability by completing a scholarly dissertation on an approved research problem which results in the contribution of significant new knowledge. The final examination primarily covers this dissertation research.

COURSES

205—Fundamentals of Medical and Public Health Microbiology (4). Covers fundamental principles of infection, immunity and control of infectious disease agents. Designed primarily for nursing and health-related profession.

301—Medical Microbiology (8). For graduate students and sophomore medical students. Fundamentals of microbiology and immunology with emphasis on the pathogenic bacteria, fungi, rickettsia, viruses, animal parasites and the host-parasite relationships on diseases they produce. Prerequisites: organic chemistry, and general bacteriology recommended.

304—Immunology (3). Antigens, antibodies, T cell receptors, lymphocyte interactions, developmental biology of the immune system, immunoregulation (autoimmunity, transplantation, tumor immunology and immunopathology) and immunodeficiency. Prerequisite: organic chemistry, and biochemistry recommended.

340—Microbial Physiology (3) (same as Veterinary Microbiology 340).

346—Genetics of Microorganisms (3) (same as Biological Science 346). Lectures and readings in genetics of prokaryotic and eukaryotic microorganisms and genetics of microbial organelles. Prerequisites: 202 or equivalent and 212 or equivalent.

400—Problems (cr. arr.). Students assigned individual problems in microbiology for library or lab investigation. Prerequisite: strong background in microbiology.

401—Topics (cr. arr.). Current topics, highly specialized topics taught infrequently, or courses taught by visiting professors. Prerequisite: instructor's consent.

403—Advanced Medical Microbiology (cr. arr.). Similar to 301 but treats medical microbiology and immunology in a more advanced manner. Methods of preparation and instruction stressed. Prerequisite: 301 or equivalent.

404—Pathogenic Mechanisms (cr. arr.). Pathogenic microbes, their toxins, virulence factors and interactions with the host. Prerequisites: 301 or equivalent and Biochemistry 304 or equivalent.

407—Advanced Immunology (3). Lectures and discussions emphasizing topics of current interest in immunology with detailed consideration of the current status of research in these areas. Prerequisite: 304 or instructor's consent.

410—Seminar (1). Presentation and critical discussion of student and staff research, current literature and guest lectures on subjects in various areas of microbiology.

430—Molecular Biology I (3) (same as Biochemistry 430). Detailed examination of current fundamental concepts of molecular genetics of bacteria, bacteriophages and yeast. Experimental approaches to analysis of the physical structures of genomic nucleic acids, the biochemistry and genetics of mutations, replications, gene transfer and gene expression will be examined in depth from reports in the current literature. Biological Sciences 370 introduces may of the covered topics at a less advanced level. Prerequisites: Biochemistry 272, Biological Sciences 202 or equivalents or instructor's consent.

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: 430 or instructor's consent.

490—Research (cr. arr.). 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.

Music

College of Arts and Science
140 Fine Arts Center (314)882-2604

FACULTY

Carleton B. Spotts, interim chairman, professor, MM, Manhattan School of Music
Alexander Pickard, assistant chairman, associate professor, DMA, Eastman School of Music
Ira C. Powell, assistant chairman, associate professor, DMEd, University of Oklahoma
Wendy Sims, director of graduate studies in music education, assistant professor, PhD, Florida State University
Charles Kyriakos, director of graduate studies in music, associate professor, PhD, Indiana University
John Cheetham, professor, DMA, University of Washington
Raymond Herbert, professor, MM, Eastman School of Music, University of Rochester
W. Thomas McKenney, professor, PhD, Eastman School of Music, University of Rochester
Betty Scott, professor, PhD, Florida State University
Charles Sherman, professor, PhD, University of Michigan
James Burk, associate professor, DMEd, University of Oklahoma
Costanza Cuccaro, associate professor, BM, University of Iowa
Edward Dolbashian, associate professor, MMA, Yale University
Steven Geibel, associate professor, MM, University of Missouri-Columbia
Dale J. Lonis, associate professor, MM, Northwestern University
Laurence Lowe, associate professor, MM, Eastman School of Music, University of Rochester
John McLeod, associate professor, MM, Manhattan School of Music
David Rayl, associate professor, DMA, University of Iowa
Eva Szekely, associate professor, MS, Juilliard School of Music
Edward Thaden, associate professor, DM, Florida State University
Janice Wenger, associate professor, DMA, University of Missouri-Kansas City
Dan Willett, associate professor, MM, Michigan State University
Barbara Wood, associate professor, MA, University of Missouri-Columbia
Martin Bergee, assistant professor, PhD, University of Kansas

Michael Budds, assistant professor, PhD, University of Iowa
Paul Garritson, assistant professor, MM, Yale University
Kate Hamilton, assistant professor, MM, Peabody Conservatory
Jane Allen, instructor
Gary Grant, instructor, MM, University of Missouri-Columbia
Brian Horne, instructor, MM, Indiana University
Tim Myers, instructor, BM, Northwestern University
Edwin Penhorwood, instructor, MFA, University of Iowa
Norman Ruebling, instructor, MEd, University of Missouri-Columbia
Sue Stubbs, instructor, MM, University of Missouri-Columbia
Thomas Wubbenhorst, instructor, MM, Yale University

DEGREES: MA and MM in music; and MA, MEd, 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 (MEd), 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 of 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 Arts Quintet.

The music section of the Fine Arts Center 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 keyboard laboratory for class piano, 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 examinations in music history and theory. The entrance examinations begin at 9:00 a.m. in Room 146 of the Fine Arts Center on the first day of registration for the fall, winter and summer sessions. In addition, performance majors are auditioned by the faculty in their performance 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 for 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, as well as 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, organ, strings, voice, woodwind, brass and percussion instruments. A candidate must have a BM degree (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 BM, then such a program must be given by the student prior to 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 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, six hours of music theory and Introduction to Graduate Study 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), four hours of 16th- or 18th-century counterpoint and four hours of orchestration, an additional two-hour theory elective is required 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 33 hours, including 20 hours of advanced courses in theory, five to six hours of music history and five to six hours of applied music. 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 by a faculty committee over their projects.

Conducting. Programs in choral, band and orchestral conducting have been established. Entrance to the conducting program requires a bachelor's degree in music, which was based on a choral/vocal or band or orchestra instrumental major. The curriculum for each conducting emphasis includes: Introduction to Graduate Study in Music (two hours), six hours in both music history and music theory, two conducting recitals, study in choral and instrumental conducting, repertory and techniques, ensemble performance, and applied study.

THE MASTER OF ARTS DEGREE is offered with a concentration in music history. A minimum of 32 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 particular 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 concentrating 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, four hours in counterpoint, four hours in form and analysis, eight hours of music history, and reading knowledge of at least one foreign language.

The music history major may include eight hours of upperclass work in applied music courses at the 300 level in partial satisfaction of the requirements for the degree. Music history courses 321, 322, 323, or 324 may be included for graduate credit if not used to satisfy prerequisites for admission. In addition to the course requirements of 14 to 20 hours of music history and an outside course, a formal thesis on some phase of music history is required. This may include up to eight hours graduate credit in 490 Research.

COURSES

MUSIC-GENERAL

300—Problems (cr. arr.). 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 and music performance/pedagogy.

301—Topics (cr. arr.). 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 (cr. arr.). 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 (cr. arr.). Organized study of selected topics in music. Subjects and credit variable. May be repeated with departmental consent. Prerequisites: graduate standing and departmental consent.

402—Introduction to Graduate Study (2). Introduction to library procedures, basic sources of information in music and techniques for research.

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 (cr. arr.). Thesis course. May be repeated for additional credit. Sections are music theory, music composition, music history and performance/pedagogy

499—Seminar (1-3). Sections are music theory, music composition, music history and performance/pedagogy.

MUSIC THEORY

203—Syntax, Structure and Style of Music V (2). Study of 20th-century compositional techniques and analysis of 20th-century music. Prerequisite: 104.

204—Syntax, Structure and Style of Music VI (2). Detailed analysis of selected compositions from the 17th to 20th centuries. Individual projects and reports. Prerequisite: 203.

215—Composition III (2). Further development of creative writing in traditional forms. Prerequisite: 116.

216—Composition IV (2). Continuation of 215. Prerequisite: 215.

303—Eighteenth-Century Counterpoint I (2). Study of contrapuntal procedures and representative compositions of the 18th century. Emphasis on two-voice compositions and the style of Johann Sebastian Bach. Original composition projects canons and invention. Prerequisite: 104.

304—Eighteenth-Century Counterpoint II (2). Continuation of 303. Analysis of three- and four-voice instrumental and choral compositions. Original composition projects chorale preludes and fugues. Prerequisite: 303.

305—Sixteenth-Century Counterpoint I (2). Analysis of contrapuntal procedures and representative compositions of 16th century. Emphasis on styles of Palestrina, Lassus and Victoria. Stylistic writing in two voices. Prerequisite: 104.

306—Sixteenth-Century Counterpoint II (2). Continuation of 305. Composition of canons, mass movements and motets in three or more voices. Prerequisite: 305.

307—Orchestration I (2). Study of orchestral instruments and the process of scoring for various orchestral combinations. Prerequisite: 104.

308—Orchestration II (2). Continuation of 307. Prerequisite: 307.

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: 104.

310—Choral Arranging (2). Transcription and arrangement of music suitable for performance by various vocal ensembles. Prerequisite: 104.

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: 104.

333—Acoustics of Music (2). The study of tuning systems and the properties, production and reception of musical sound. Prerequisite: 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: 104 or equivalent.

345—Introduction to Electronic Music (2). Techniques used in the creation of music with tape recorders, voltage-controlled synthesizers and electronics. Prerequisite: 203 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 and 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: 104.

415—Composition VII (2). Intensive work in larger forms. Seminar and private lessons. Prerequisite: 316 or instructor's consent, departmental consent for repetition.

MUSIC HISTORY AND LITERATURE

221—Bach and His Time (3). Historical survey of the works of Bach, his relationship to his time and his position in history. Prerequisite: 21 or 187 recommended.

222—Haydn, Mozart and Beethoven (3). Historical, critical survey of the works of one or more of the masters of Viennese classical music. Prerequisite: 21 or 188 recommended.

223—Richard Wagner and the Music Drama (3). Wagner's life, his theories and writings on music and drama and his relationship to the 19th- century world of politics and the arts. Prerequisite: 21 or 188 recommended.

224—Stravinsky and the 20th Century (3). Historical, critical survey of the works of Stravinsky. His relation to the arts in our time. Prerequisite: 21 or 188 recommended.

297—Honors in Music History I (3). Special readings, directed research for graduation with honors in music history. Prerequisites: 187 and 188.

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.

321—Music to 1600 (3). Critical survey of the development of European music from Gregorian chant to the end of the Renaissance. Prerequisite: 187 or equivalent.

322—Music in the 17th and 18th Centuries (3). Critical survey of the development of European music from the Baroque through the Rococo and Classical periods. Prerequisite: 188 or equivalent.

323—The Romantic Period (2). 19th-century music in relationship to the Romantic Movement. Prerequisite: 188.

324—Modern Music (2). Music since 1900 emphasizing contemporary trends. Prerequisite: 188.

422—Studies in the History of American Music (2). Critical survey of the history of music in the Americas from the 16th century to the present. Prerequisites: 187 and 188 or equivalent.

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.

427—Studies in the History of Opera (2). Significant operatic masterpieces from 1600 to present. Prerequisite: instructor's consent.

428—Studies in the History of Choral Music (2). Significant choral works from Renaissance to present. Prerequisite: 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. Prerequisites: students 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 MEd degree. Recital attendance policy applies. May be repeated for credit. Prerequisites: eight hours and four 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. May be repeated for credit.

355—Studio Instruction (1-5). Acceptable as upperclass credit on BM degree, graduate credit on MA, MEd, EdD and PhD degrees. Recital attendance policy applies. May be repeated for credit. Prerequisites: eight hours and four 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 MM degree. Acceptable for graduate credit on MA, MEd, EdD and PhD degrees. May be 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

242—Seminar in String Techniques (1). In-depth study of publications, philosophies, repertory, grading and 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. Prerequisite: 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. Prerequisite: 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: 4 and 6.

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 International Phonetic Alphabet; spoken language drill, study and recitation of representative song literature. Prerequisite: sophomore standing.

271—Diction in Singing: German (1). Study of the correct principles and application of German diction in singing; the International Phonetic Alphabet; spoken language drill, study and recitation of representative song literature. Prerequisite: sophomore standing.

272—Diction in Singing: French (1). Study of the correct principles and application of French diction in singing, the International Phonetic Alphabet; spoken language drill, study and recitation of representative song literature. Prerequisite: sophomore standing.

361—Piano Pedagogy Survey I (2). Study of approaches for teaching young beginning and intermediate student and 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 and score analysis. May be repeated for additional credit. Prerequisite: 133 or instructor's consent.

434—Advanced Instrumental Conducting (2). Advanced conducting techniques in the interpretation of band and orchestral literature and score analysis. May be repeated for additional credit. Prerequisite: 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

353—Piano Literature I (2). Survey of keyboard music from 1600 to 1800. Prerequisites: junior standing and instructor's consent.

354—Piano Literature II (2). Survey of keyboard music from

Beethoven's time to the present. Prerequisite: 353 or instructor's consent.

367—Vocal Literature I (2). Introduction to and study of song literature with emphasis on style and interpretation. Prerequisite: junior standing or instructor's consent.

368—Vocal Literature II (2). Continuation of 367. Prerequisite: 367 or instructor's consent.

453—Piano Repertory I (3). Study of specific aspects of Baroque and classical keyboard music. Individual projects in research, analysis and performance. Prerequisite: 355 or instructor's consent.

454—Piano Repertory II (3). Study of specific aspects of 19th- and 20th-century piano music. Individual projects in research, analysis and performance. Prerequisite: 453 or instructor's consent.

465—Choral Repertory (2). Survey choral works from selected periods with an emphasis on various aspects of choral performance. May be repeated once for additional credit. Prerequisites: graduate standing and instructor's consent.

467—Vocal Repertory I (3). Study of specific aspects of vocal repertory. Individual projects in research, analysis and performance. Prerequisite: 355 or instructor's consent.

468—Vocal Repertory II (3). Continuation of 467. Prerequisite: 467 or instructor's consent.

470—Band Repertory (3). To survey band and wind ensemble repertoire, with emphasis on various aspects of performance practice in order to prepare the student for a career that includes conducting advanced high school and college bands and wind ensembles.

473—String Instrument Repertory I (1). Prerequisite: 355 or instructor's consent.

474—String Instrument Repertory II (1). Continuation of 473. Prerequisite: 473.

475—Orchestral Repertory (2). A survey of orchestral repertory, emphasizing various aspects of performance practice. Appropriate for graduate music conducting majors who wish to pursue a career that includes conducting orchestras at the advanced high school, college or professional levels. May be repeated. Prerequisites: conducting experience at the high school or college level and consent of instructor.

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.

341—Instrumental Ensemble (1-2). Research, preparation and performance of instrumental compositions. May be repeated for credit. Prerequisites: graduate standing, audition and instructor's consent. Sections and credit hours are philharmonic orchestra (2), chamber orchestra (1), symphonic band (2), wind ensemble (1), concert band (1), studio jazz ensemble (2) and jazz lab band (2).

342—Choral Ensemble (1-2). Research, preparation and performance of choral compositions. May be repeated for credit. Prerequisites: graduate standing, audition and instructor's consent. Sections and credit hours are: University Singers (2), Chamber Singers (1), Choral Union (1), Vocal Jazz Ensemble (2), Concert Chorale (2) and Women's Chorus (1).

346—Advanced Chamber Music (1). Study, preparation and performance of chamber music. May be repeated for credit. Prerequisites: graduate standing, audition and instructor's consent. Sections are string ensemble, woodwind ensemble, brass ensemble, percussion ensemble and jazz combo.

365—Opera Production (cr. arr.). Study, preparation and performance of selected operatic or musical theatre works in staged or concert versions. May be repeated for credit. Prerequisites: graduate standing, audition and instructor's consent.

Natural Resources

College of Agriculture, Food and Natural Resources
1-30 Agriculture Building (314)882-3436

FACULTY

Albert R. Vogt, director, professor, PhD, University of Missouri-Columbia

Milon F. George, director of graduate studies, associate professor, PhD, University of Minnesota

FISHERIES AND WILDLIFE

Erik K. Fritzell, program leader, professor, PhD, University of Minnesota

John Faaborg, professor, PhD, Princeton University

Leigh H. Fredrickson, professor, PhD, Iowa State University

John R. Jones, professor, PhD, Iowa State University

Ronald D. Drobney, associate professor, assistant unit leader-wildlife, PhD, University of Missouri-Columbia

David Galat, graduate program leader-fisheries, associate professor, assistant unit leader-fisheries, PhD, Colorado State University

Charles F. Rabeni, associate professor, unit leader, PhD, University of Maine

Mark R. Ryan, graduate program leader-wildlife, associate professor, PhD, Iowa State University

Robert S. Hayward, assistant professor, PhD, The Ohio State University

Joseph B. Hunn, adjunct assistant professor, PhD, Michigan State University

Thomas LaPoint, adjunct assistant professor, PhD, University of Wyoming

Charles H. Nilon Jr., assistant professor, PhD, State University of New York-Syracuse

Douglas B. Noltie, assistant professor, PhD, Western Ontario University

Frank R. Thompson, III, adjunct assistant professor, PhD, University of Missouri-Columbia

Ernie P. Wiggers, assistant professor, PhD, Texas Tech University

FORESTRY

Carl D. Settergren, program leader, professor, PhD, Colorado State University

Merton F. Brown, professor, PhD, University of Iowa

Harold E. Garrett, professor, PhD, University of Missouri-Columbia

Gray S. Henderson, graduate program leader-forestry, professor, PhD, Cornell University

William B. Kurtz, professor, PhD, University of Arizona

Stephen G. Pallardy, professor, PhD, University of Wisconsin

Bruce E. Cutter, associate professor, PhD, University of Missouri-Columbia

Milon F. George, associate professor, PhD, University of Minnesota

Marc J. Linit, associate professor, PhD, University of Arkansas

John P. Dwyer, assistant professor, PhD, University of Missouri-Columbia

Terry Robinson, research assistant professor, PhD, Iowa State University

PARKS, RECREATION AND TOURISM

Steven C. Lamphear, chairman, associate professor, PhD, University of Georgia

Glenn A. Gillespie, professor, PhD, University of Missouri-Columbia

Keith B. Roys, professor, 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

C. Randal Vessell, graduate program leader-parks, recreation and tourism, associate professor, PhD, University of Iowa

Glenn D. Weaver, associate professor, MS, University of Missouri-Columbia

Marshall L. R. Masek, assistant professor, MS, University of Missouri-Columbia

SOIL SCIENCE

Robert W. Blanchar, professor, University of Minnesota

James R. Brown, professor, PhD, Iowa State University

Gregory A. Buyanovsky, professor, PhD, State University of Rostov

George H. Wagner, professor, PhD, University of Missouri-Columbia

Clark J. Gantzer, associate professor, PhD, University of Minnesota

Randall J. Miles, associate professor, PhD, Texas A&M University

Stephen H. Anderson, assistant professor, PhD, North Carolina State University

R. David Hammer, assistant professor, PhD, University of Tennessee

Diann Jordan, assistant professor, PhD, Michigan State University

Newell R. Kitchen, assistant professor, PhD, Colorado State University

DEGREES: MS and PhD in fisheries and wildlife

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.

The fisheries and wildlife group has well-equipped laboratories and an aquarium facility at MU. 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, near Puxico, Missouri, the Gaylord Memorial Wildlife Research Laboratory. Located on the Missouri Department of Conservation's Duck Creek Wildlife Area, and adjacent 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 U.S. Fish and Wildlife Service, is staffed with three Fish and Wildlife Service 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 in Stephens Hall contain more than 7,000 specimens. The Glen Smart waterfowl collection, consisting of more than 200 species of mounted waterfowl of the world, is on display in the lower corridor of LeFevre Hall. The fish collection in Stephens Hall 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 25-30 hours in biological 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 are desirable.

Admission is based upon the following criteria:

- the GRE general test and the subject test in biology
- three letters of recommendation from people who can attest to the candidate's scholastic ability, and
- 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.

Further information may be obtained by writing the Graduate Program Leader, Fisheries and Wildlife Graduate Office, 1-74 Agriculture Building, Columbia, Mo. 65211, or by calling (314)882-7045.

DEGREES: MS and PhD in forestry

FORESTRY: Graduate education in forestry has two objectives: to provide, through either master's- or doctoral-level education, forest scientists to meet the research and teaching needs basic to the forestry profession; and to offer opportunity for forestry education at the master's level to the holder of the baccalaureate degree with a major in one of the biological, physical or social sciences.

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. The dissertation 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 several subfields of forestry biometrics, ecology, economics, entomology, hydrology, land-use planning, mensuration, pathology, photogrammetry, physiology, policy, recreation, silviculture, soils, timber management, water quality and wood science.

The school works closely with the North Central Forest Experiment Station, Forest Service and USDA. In addition, excellent cooperation is maintained with the Missouri Department of Conservation and the Department of Natural Resources.

The school and the University have direct control over or access to nearly 9,600 acres of forested lands on which research is underway. Three tracts near Columbia and Poplar Bluff, Mo. represent a variety of forest types and conditions. Access to other forest lands, both state and federal, is available through cooperative agreements. Facilities at MU include a chemical analytical laboratory, a large nuclear reactor, an IBM mainframe computer, personal computing laboratory, electron microscopes, other specialized laboratories and equipment and Ellis Library.

Acceptance for advisement in forestry is based upon undergraduate scholastic performance. 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, or in the case of one who has been employed for several years, the type and quality of experience since completion of the undergraduate degree. Each applicant should offer three letters of recommendation by individuals qualified to evaluate scholarly capacity and scores on the GRE General Test. Doctoral candidates must demonstrate a higher level of achievement in each of these criteria.

Some graduate students qualify for McIntire-Stennis funds or state research support for assistantships, or for NSF or other Fellowships.

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 required course work.

Work required of students without a forestry degree who desire a professional forestry education, includes courses in dendrology, utilizing forest resources, resource measurements, forest inventory, forest fire control and use, silvics, silviculture, forest photogrammetry, watershed management, timber management, forest economics, recreational land management, public resource policy, management-utilization trip and land use planning. Several 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. Research toward a thesis normally shall not exceed eight hours. The GPA of all course work submitted for the degree must be B or better.

A thesis, or a minimum of five semester hours of non-thesis research acceptable to the student's committee, shall be completed prior to the final examination. 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 research, college teaching or other advanced scientific or professional careers. The student pursuing the doctoral program is expected to pass a qualifying comprehensive and final examination. The qualifying examination determines whether the student's background is adequate to enter the PhD program, and ascertains areas of weakness in which a candidate will be required to gain background through appropriate course work. The comprehensive examination also has two objectives to ascertain whether a student has acquired sufficient depth and breadth of knowledge in selected areas of concentration; and to evaluate the candidate's capacity to apply knowledge in new situations and to integrate that knowledge toward the solution of theoretical or applied problems. The final examination is directed primarily toward exploration of the dissertation.

Requirements for foreign language and a collateral field, if any, are determined by the student's doctoral program committee. The program 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 program committee, which must represent at least two disciplines in addition to the major field.

The degree is conferred only upon those students who, after extensive study, have demonstrated high attainment in their particular specialization in forestry and who have completed independent research contributing to knowledge in the field.

Further information may be obtained by writing the Graduate Program Leader, Forestry Graduate Office, 1-74 Agriculture Building, Columbia, Mo. 65211, or by calling (314)882-7045.

DEGREES: MS in parks, recreation and tourism

PARKS, RECREATION AND TOURISM: The purpose of the graduate degree is to prepare the candidate for decision-making positions of employment 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 excellence.

MASTER'S DEGREE: To be accepted as a candidate for the degree, an applicant should possess an undergraduate degree and performance that displays a breath and depth of university education in social, behavioral, mathematical

and natural science, as well as 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 a minimum of deficiency course work requirements in most cases. The GRE general test is required for admission into the program.

A minimum of 30 credit hours is required for graduation, including a minimum 15 hours at the 400 level. Course requirements include a minimum of 12 credit hours of theory-based contact courses within the major, and an independent scholarship effort within the project or thesis format.

Further information may be obtained by writing the Graduate Program Leader, Parks, Recreation and Tourism Graduate Office, 624 Clark Hall, Columbia, Mo. 65211, or by calling (314)882-7086.

SOIL SCIENCE: The soil science faculty, in cooperation with the agronomy program (see Agronomy), conduct instruction and research in the following areas: environmental quality, pedology, soil mineralogy, soil chemistry and biochemistry, soil physics, soil conservation, soil microbiology, soil fertility and soil-plant relationships.

Further information may be obtained by writing the Graduate Program Leader, Soil Science Graduate Office, 144 Mumford Hall, Columbia, Mo. 65211, or by calling (314)882-6301.

COURSES

NATURAL RESOURCES-GENERAL

211—Resource Measurements (3). Sampling methods and principles of measurement as applied to a variety of natural resources and uses, including fisheries, range, recreation, timber, water and wildlife. Prerequisite: a course in statistics or instructor's consent.

307—Soil Physics (5). (same as Agronomy 307).Study of the physical properties of soils and theory and methodology of selected instrumentation for the evaluation of those properties. Topics include soil solids, water, solutes, aeration, and temperature. Prerequisites: 100, Physics 21 or equivalent.

308—Soil Conservation (3). (same as Agronomy 308) Conservation of soil with respect to topsoil, soil productivity and fertility. Prerequisite: 100. Recommended: Agricultural Engineering 201.

312—Soil Microbiology (3). (same as Agronomy 312) Micro-organic life of soil in relation to soil fertility. Prerequisites: 100 and general bacteriology.

313—Soil Fertility and Plant Nutrition (3). (same as Agronomy 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: 30 and 100, Mathematics 10 and eight hours of college chemistry.

314—Soil Fertility and Plant Nutrition Laboratory (2). (same as Agronomy 314) The application of elementary analytical procedures to the evaluation of the nutrient status of soils and crop plants. Prerequisite: concurrent or previous enrollment in 313.

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 and nutrient loss. Examines methodologies for predicting management impacts. Prerequisites: Agronomy 100, introductory inorganic chemistry or instructor's consent.

320—Soil Genesis, Mapping and Classification (4). (same as Agronomy 320) Identification of soils and soil systems in the natural landscape and factors and processes determining their development. Prerequisite: 100.

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. Prerequisite: senior standing or instructor's consent.

391—Land Use Planning (2). Land-use planning as applied to forest and related lands. Demographic, socio-economic and legal factors affecting land use. Role of zoning, deed covenants laws and environmental impact requirements. Prerequisite: senior standing or instructor's consent.

410—Seminar (1). (same as Agronomy 410) In-depth development of advanced aspects of crop and soil sciences through reviews of results of research in progress and current scientific publications.

412—Decision Making and Analysis in Natural Resources Management (3). Alternative decision-making processes, goals, values and choices. Economic analysis, systems analysis and decision models for allocating resources in management and planning. Quantitative methods and applications. Prerequisite: 318 or instructor's consent.

414—Advanced Soil Fertility (3). (same as Agronomy 414) History and application of concepts of soil fertility and plant nutrition. Prerequisites: 313 and 315 or equivalent, 14 hours of college chemistry and five hours of calculus.

418—Soil Chemistry (3). (same as Agronomy 418) Equilibrium, kinetic and biological principles describing mineral solubility and transformations in soil-water-plant systems. Prerequisites: calculus and a 300-level soil science course requiring chemistry.

420—Pedology (5). (same as Agronomy 420) Soil-landscape relationships; quantitative soil morphological descriptions; temporal and spatial soil variability; soil forming processes; readings from current and classical pedological literature. Prerequisites: six hours of 300-level soils, or geology or instructor's consent.

450—Non-thesis Research (1-9). (same as Agronomy 450) Research not expected to terminate in dissertation.

490—Thesis Research (1-10). (same as Agronomy 490) Original investigations in crop and soil sciences in support of thesis for master's and doctoral candidates.

FISHERIES AND WILDLIFE

201—Topics in Forestry, Fisheries and Wildlife (cr. arr.). Organized study of selected topics. Intended primarily for undergraduate forestry, fisheries and wildlife students. Subjects and credit may vary from semester to semester.

266—Ornithology (4) (same as Biological Sciences 266). Structure, identification, habits and importance of regional birds. Field work, lectures and lab. Prerequisites: five hours of biological sciences or instructor's consent.

298—Senior Honors Research (1-3). Prerequisites: 3.3 GPA and instructor's consent.

299—Senior Honors Research (1-3). Prerequisites: 3.3 GPA and instructor's consent.

300—Problems (cr. arr.). Topics in forestry, fisheries and wildlife.

301—Topics in Forestry, Fisheries and Wildlife (cr. arr.). Organized study of selected topics. Intended for upper division and graduate student. Subjects and credit may vary from semester to semester.

307—Mammalogy (4) (same as Biological Sciences 309). Taxonomy, distribution, structure, habits and importance of mammals, emphasizing those of central United States. Prerequisite: junior standing or instructor's consent.

311—Ichthyology (4) (same as Biological Sciences 311). Taxonomy distribution, life history, ecology of fishes, emphasizing those found in Missouri. Prerequisites: eight hours of biology or equivalent.

312—Fish Husbandry (3). Principles, practices and programs applied to the intensive and efficient production and utilization of hatchery fishes. Prerequisite: 311 or instructor's consent.

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. Prerequisite: 266 or instructor's consent.

322—Range and Wildlife Habitat Management (3). Range management practices in the United States and their ecological implications. Management of wildlife habitat, particularly that which is forest related, to maintain desired species. Prerequisites: Biological Sciences 302 or 362, or instructor's consent. No credit for fisheries and wildlife majors.

323—Wildlife Management Techniques (3). Methods of appraising and manipulating wildlife populations and their habitats. Prerequisite: 327 concurrently or equivalent or instructor's consent. One week of field work before semester opens is required.

324—Limnology (3-4) (same as Biological Sciences 324) (lecture/lab four hours; lecture only three hours). Ecology of inland waters with emphasis on productivity. Prerequisite: senior standing or Biological Sciences 362.

326—Endangered Species Management (3). In-depth study of the ecological, legal and sociological aspects of endangered species management. Prerequisites: 333 and Biological Sciences 362.

327—Principles of Wildlife Management (3). Introduction to management principles for terrestrial vertebrate populations and habitats based on ecological concepts applied to current social, economic and legal conditions. Co-requisite: Biological Science 362.

328—Fisheries Management (3). Introduction to the principles and techniques of fishery management. Integrates ecological principles with social, economic and legal considerations. Prerequisites: Biological Science 311, 333, 362, or equivalent.

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. Prerequisite: 311 or equivalent.

330—Applied Wildlife Habitat Management (3-4). Applications of habitat modeling, grazing management, silviculture, prescribed burning and other practices used in wildlife habitat management. Field trip during spring break. Prerequisites: 323, 327, or instructor's consent.

331—Aquatic Toxicology (2). Advanced study of the role of toxicants in aquatic environments. Covers organismic, population and community responses to different classes of pollutants. Prerequisites: 324 and Biological Sciences 362 or Chemistry 210 or equivalent.

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 of biology, Mathematics 207 or equivalent.

336—Urban Wildlife Management (3). Reviewing the theory and practice of applying ecological concepts to the management of wildlife species in urban areas. Co-requisite: 327 or instructor's consent.

350—Special Readings (cr. arr.). Critical review of current literature and research in forestry, fisheries and wildlife, and methods of presenting research results.

360—Management-Utilization Trip (1). One-week field trip to study utilization and management practices of large operations. Prerequisite: senior standing or instructor's consent.

380—Resource Practicum (2). Multidisciplinary planning of a natural resource management program. Fisheries and Wildlife majors only. Prerequisite: senior standing or instructor's consent.

401—Topics in Forestry, Fisheries and Wildlife (cr. arr.) Organized study of selected topics. Subjects and credit may vary from semester to semester. Prerequisite: instructor's consent.

410—Seminar (1). Discussions of current developments in forestry, fisheries and wildlife, and critical study of research programs.

415—Advanced Ichthyology (3). Identification, ecology, economics of selected freshwater, marine fishes. Bibliographic sources, current literature in fishery biology. Prerequisite: 311.

416—Research Methods (3). Interrelated roles of logic, observation, experience and experiment in scientific inquiry. History, bibliography, experimental methods, publication and selected readings in forestry research.

418—Advanced Fishery Management (3). Theory and practice in present-day fishery management. Prerequisites: 311, 324 and 327.

419—Wildlife Ecology (3). Backgrounds of land use, ecological forces basic to wildlife management and examination of literature. Prerequisites: 150, 307, 20 hours of biology, including Biological Sciences 362, or instructor's consent, fisheries and wildlife majors only.

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.

423—Plant-Water Relations Laboratory (2). Introduction to techniques and instrumentation used in studies of plant-water relations. Co-requisite: 421.

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 or equivalent.

427—Advanced Limnology (3). Physical, chemical and biological processes of lakes and streams emphasizing biological production, water quality and modern problems. Field and laboratory techniques. Prerequisites: 324, Biological Sciences 362, 207 or equivalent.

428—Nutrient Cycling in Forested Watersheds (3). Principles of nutrient cycling in forested ecosystems and relation to water quality. Comparison of nutrient cycles and assessment of the impact of harvesting. Prerequisites: 302, Biological Sciences 362 or equivalent, Agronomy 312 and 319 desirable, and instructor's consent.

429—Wetland Ecology (3). A survey of the wetlands of North America, with emphasis on nutrient dynamics, habitat structure, management, legislation and regulations and man's impacts. Prerequisites: 324, Biological Sciences 362 and instructor's consent.

431—Freshwater Invertebrate Ecology (3). Examines 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.

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.

435—Wildlife Nutritional Ecology (3). A comprehensive and comparative treatment of how 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 consent of instructor.

436—Advanced Waterfowl Ecology (3). Advanced studies of waterfowl ecology. Emphasis on mating systems, foraging ecology, energetics and post-breeding and winter ecology. Prerequisites: 266, 316 and Biological Science 362 or instructor's consent.

440—Vertebrate Behavior 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: Biology 342 and 362 or equivalents.

450—Research (cr. arr.). Original research not leading to preparation of dissertation.

490—Research (cr. arr.). Original investigation for presentation in a dissertation.

FORESTRY

201—Topics in Forestry, Fisheries and Wildlife (cr. arr.). Organized study of selected topics. Intended primarily for undergraduate forestry, fisheries and wildlife students. Subjects and credit may vary from semester to semester.

204—Wood Technology (3). Structure and identification of commercial woods. Relation of growth to physical and chemical properties of wood.

205—Forest Pathology (3) (same as Plant Pathology 205). Study of tree diseases, causal agents and principles of disease control.

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.

207—Forest Fire Control and Use (2). Fundamentals of all phases of fire protection. Objectives and techniques in use of fire.

210—Forest Entomology (3) (same as Entomology 210). Primarily for forestry students, open to others by arrangement. Life histories, habits, injuries and methods of controlling the more important insect pests of forest products.

245—Wood Science (5). Basic physical and chemical properties of wood discussed in terms of wood structure. Prerequisite: junior standing or instructor's consent.

253—Light Construction (3). Planning, design and control of residential and light construction projects. Proper use of materials and approved methods of construction. Estimating unit and total materials and labor requirements from blueprints and specifications.

254—Wood Processing (3). Orthoganol cutting, peripheral milling and abrasive processes as used in the forest products industry. Use of adhesives and finishes in production sequences.

255—Wood Seasoning and Preservation (3). Air seasoning and kiln drying of wood. Pressure and non-pressure methods of wood preservation. Agencies of wood deterioration and their control.

256—Light Construction Estimating (3). Procedures and processes of estimating the cost of light construction - usually taken to mean family homes. Prerequisite: 253 or consent of instructor.

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: junior standing, 151, or instructor's consent.

295—Forest Products Utilization (3). Raw material requirements, manufacturing processes and grades and standards of wood and wood-based products. Prerequisite: 143 or 204, or equivalent, or instructor's consent.

298—Senior Honors Research (1-3). Prerequisites: 3.3 GPA and instructor's consent.

299—Senior Honors Research (1-3). Prerequisites: 3.3 GPA and instructor's consent.

300—Problems (cr. arr.). Topics in forestry, fisheries and wildlife.

301—Topics in Forestry, Fisheries and Wildlife (cr. arr.). Organized study of selected topics. Intended for upper division and graduate student. Subjects and credit may vary from semester to semester.

302—Forest Ecology (2). Lectures on the inter-relationships or forest vegetation and its environment. Prerequisites: Geology 1 or 2, Chemistry 1 or 11, Agronomy 100, or instructor's 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.

304—Tree Physiology (2). Lectures on physical and chemical phenomena involved in the functions and activities of trees. Prerequisites: Biological Sciences 12; Chemistry 1 or 11 or consent of instructor.

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. Prerequisite: 154 or instructor's consent.

309—Watershed Management (3). Principles of managing watersheds, including effect of vegetation on soil erosion, soil moisture and stream flow. Prerequisite: 141 or instructor's consent.

314—Timber Management (3). Business management and silvicultural regulation of the forest for timber production. Timber taxation and the legalities of timberland ownership. Prerequisites: 303 and 318, or instructor's consent.

318—Forest Economics (3). Economic principles applied to production/marketing of goods and services from forest land, emphasizing capital and land factors and investment alternatives related to time. Prerequisites: mathematics requirement completed, Agricultural Economics 50 or Economics 51.

319—Advanced Forest Management (3). Forest management planning of public agencies and private industry, with emphasis on inventory control and allowable cut determination; effect of federal income taxes on management practices. Prerequisites: 314 and 318, or instructor's consent.

320—Recreation Land Management (3). Defines and discusses outdoor recreation management within the framework of multiple use management of forest-type lands. Prerequisite: junior standing or instructor's consent.

340—Advanced Recreation Land Management (3) (same as Parks, Recreation and Tourism 340). Advanced study of problems facing forest recreation managers. Topics include rivers recreation, wilderness management and citizen participation in decision making. Prerequisite: 320 or equivalent or instructor's consent.

350—Special Readings (cr. arr.). Critical review of current literature and research in forestry, fisheries and wildlife, and methods of presenting research results.

360—Management-Utilization Trip (1). One-week field trip to study utilization and management practices of large operations. Prerequisite: senior standing or instructor's consent.

361—Recreational Forestry Trip (1). One-week field trip to study recreational land management. Prerequisite: senior standing or instructor's consent.

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 and 144.

380—Resource Practicum (2). Multidisciplinary planning of a natural resource management program. Forestry majors only. Prerequisite: senior standing or instructor's consent.

401—Topics in Forestry, Fisheries and Wildlife (cr. arr.) Organized study of selected topics. Subjects and credit may vary from semester to semester. Prerequisite: instructor's consent.

403—Physiological Responses to Environment (3) (same as Biological Sciences 403). Changes induced in plants by variations in temperature, water and light. Prerequisite: Biological Science 313 or equivalent.

405—Forest Soils (3). Physical, chemical and biological properties of forest soils in relation to tree growth. Prerequisite: 303 or instructor's consent.

407—Applied Silviculture (3). Ecological and economic factors affecting application of silviculture in each of 18 forest regions in the United States. Prerequisite: 303.

408—Forest Hydrology (3). Hydrology of forests and other wildlands. Effect of forest and range cover manipulation on the quantity, quality and timing of water yields. Hydrologic instrumentation, analysis and simulation in watershed management. Prerequisite: 309 or instructor's consent.

410—Seminar (1). Discussions of current developments in forestry, fisheries and wildlife, and critical study of research programs.

416—Research Methods (3). Interrelated roles of logic, observation, experience and experiement in scientific inquiry. History, bibliography, experimental methods, publication and selected readings in forestry research.

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. Prerequisite: 211 or 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 continuim. Effects of water deficits on physiological processes. Prerequisite: Biological Science 313 or equivalent.

423—Plant-Water Relations Laboratory (2). Introduction to techniques and instrumentation used in studies of plant-water relations. Co-requisite: 421.

425—Tree Growth-Quality Relationships (3). Response of tree growth (wood formation) to such environmental influences fertilization, moisture, nutrient supply and wounding pruning. Prerequisite: 204 or 303 or instructor's consent.

428—Nutrient Cycling in Forested Watersheds (3). Principles of nutrient cycling in forested ecosystems and relation to water quality. Comparison of nutrient cycles and assessment of the impact of harvesting. Prerequisites: 302, Biological Sciences 362 or equivalent, Agronomy 312 and 319 desirable, and instructor's consent.

450—Research (cr.arr.). Original research not leading to preparation of dissertation.

490—Research (cr.arr.). Original investigation for presentation in a dissertation.

PARKS, RECREATION AND TOURISM

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. Prerequisites: 10, 11, 111 or instructor's consent.

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.

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. Prerequisite: professional core or instructor's consent.

226—Introduction to Leisure and 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. Prerequisites: 10, 11, 111 or instructor's consent.

227—Delivery Models in Therapeutic Recreation (3). An investigation of therapeutic recreation service delivery models of the i11 and disabled in both institutional and community settings. Particular emphasis will be placed on advanced leadership and therapeutic interactional skills and dynamics. Prerequisite: 226 or instructor's consent.

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. Prerequisites: 10, sophomore standing or instructor's consent.

231—Principles of Interpretive Outdoor Recreation (3). Interpretive principles and techniques employed to communicate values, natural history and cultural features to the recreation user. Prerequisite: majors only, completion of professional core or instructor's consent.

289—Recreation and Park Administration Field Experience (12). Supervised experience in an approved organization concurrent with seminars related to individual field assignments. Prerequisites: 189, majors only, instructor's consent.

300—Problems (3).

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. Prerequisites: majors only, completion of professional core or instructor's consent.

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. Prerequisites: 326 and instructor's consent.

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 and planning guidelines emphasized. Objectives: provide fundamentals for recreation planning with aged individuals/groups. Prerequisite: instructor's consent.

331—Administration of Outdoor Recreation - Educational Programs (3). Philosophies, essential principles, methods, techniques, resources, administrative and program practices for outdoor recreation and education. Prerequisites: majors only and completion of professional core.

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. Prerequisite: instructor's consent.

340—Advanced Recreation Land Management (3) (same as Forestry, Fisheries and Wildlife 340). Advanced study of problems facing forest recreation managers. Topics include rivers recreation, wilderness management and citizen participation in decision making. Prerequisites: 320 or equivalent or instructor's consent.

355—Private and Commercial Recreation Principles and Practice (3). Considers principles, practices, influences in public/private leisure services and influence of tourism/travel on public private recreation services. Prerequisites: majors only and completion of professional core or instructor's consent.

356—Group Tour Development and Management (3). Analysis of the principles and practices of group tour planning and management. Prerequisite: 355 or instructor's consent.

357—Tourism Development (3). Comparative study of initiating, planning and implementing a tourism enterprise and the organization of community resources for developing and controlling a tourism industry.

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.

400—Problems (1-6). Independent research on special projects. Prerequisites: adviser's consent, open to recreation majors and minors only.

401—Constructs of Leisure (3). Review analysi and implications of fundamental psycho-social determinants of leisure behavior. Application theories of determinants to existing and proposed leisure service systems. Prerequisite: majors only or instructor's consent.

403—Research Methods in Recreation and Park Administration (3). Analysis of basic research methodology. Review and analysis of research work completed in recreation, park and leisure field, Prerequisites: graduate major and completion of inferential statistics work.

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. Prerequisite: graduate major or instructor's consent.

406—Financial Operations in Leisure Service Delivery (3). Revew and critical analysis of financial functions, strategies and methodology as related to public and private recreation and leisure service enterprises. Prerequisite: majors only.

410—Guided Reading in Recreation and Park Administration (1-3). Selected reading in recreation and park administration identified to fulfill a graduate student's academic needs or specialized interests. Prerequisite: graduate major or instructor's consent.

411—Independent Work in Recreation and Park Administration (1-3). Independent research or special projects in recreation and park administration. Prerequisite: graduate major or instructor's consent.

426—Analysis of Leisure with Special Populations (3). Survey of the delivery of leisure services to special populations in institutional, transitional and community-based settings. Emphasis in the etiology, characteristics and treatment of various disabling conditions and concomitant leisure facilitation techniques.

427—Contemporary Issues in Therapeutic Recreation (3). The course will include new issues and ideas in the field of therapeutic recreation, such as registration, insurance, liability, licensure, assessment and how they relate to practitioners and services to clients.

480—Research Project (1-6). Individual research on approved project. Involves creativity and sholarly inquiry where product does not adhere to the traditional thesis format. Prerequisite: graduate major.

481—Field Instruction (1-6). Supervised student practice in recreation, park or related settings under qualified instructor. Prerequisites: 289 or equivalent and graduate departmental standing.

490—Thesis Research (1-6). Research leading to thesis in field of recreation. Prerequisites: graduate standing and 481 or equivalent.

Nuclear Engineering

College of Engineering
333 Electrical Engineering Building
(314)882-3550

FACULTY

J. F. Kunze, chairman, R. L. Tatum professor, PhD, Carnegie Institute of Technology

W. H. Miller, director of graduate studies, director of the Energy Systems and Resources Program, professor, PhD, University of Missouri-Columbia

R. M. Brugger, professor, PhD, Rice University

R. L. Carter, professor emeritus, PhD, Duke University

A. H. Emmons, professor emeritus, PhD, University of Michigan

R. A. Holmes, professor, chief of Nuclear Medicine Service, Truman Veterans Hospital, MD, Temple University

W. R. Kimel, professor emeritus, PhD, University of Wisconsin

S. K. Loyalka, Curator's Professor, PhD, Stanford University

M. A. Prelas, H. O. Croft Professor, PhD, University of Illinois-Urbana

P. K. Lee, associate professor, director of Health Physics Services, PhD, Purdue University

S. M. Langhorst, assistant professor, director of Health Physics at Research Reactor, PhD, University of Missouri-Columbia

T. Ghosh, research assistant professor, PhD, Oklahoma State University

M. Glascock, research assistant professor, PhD, University of Iowa

R. V. Tompson, research assistant professor, PhD, University of Missouri-Columbia

ADJUNCT FACULTY

D. M. Alger, consultant, PhD, University of Missouri-Columbia

E. J. Boote, assistant professor of radiology, PhD, University of Wisconsin

L. A. Corwin, professor, DVM, Colorado A&M, PhD, Colorado State University

K. Hickey, medical physicist, Regional Radiation Therapy Center, Columbia, Mo., PhD, University of Missouri-Columbia

G. Hughes, supervisor of Nuclear Safety and Research-Callaway Power Plant, Union Electric, Co., PhD, University of Missouri-Columbia

S. B. Pickup, assistant professor of radiology, PhD, Drexel University

Z. Shi, director of Medical Physics, Truman Medical Center, University of Missouri-Kansas City, PhD, University of Missouri-Columbia

DEGREES: MS and PhD in nuclear engineering, MS in nuclear engineering (health physics) and MS in nuclear engineering (medical physics)

Area research topics include nuclear materials management, aerosol mechanics, reactor safety analysis, nuclear energy conversion, reactor physics, reactor design, non-destructive inspection, 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 Missouri University Research Reactor (MURR), 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.

Other facilities include the Particulate Systems Research Center, a Cobalt irradiator, a plasma fusion laboratory, nuclear instrumentation, a variety of digital computers, printers and plotters.

Financial assistance includes federal (Department of Energy), industrial (primarily electrical utility funding) and MU fellowships, teaching, research assistantships and sponsored research assistantships, as well as special fellowship opportunities for women and minorities. MU is a participating university in the Oak Ridge Associated Universities (ORAU) Nuclear Science and Engineering Health Physics and Waste Management Fellowships and the Graduate and Professional Opportunities Program Fellowships for minorities and women. 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 (although exceptions are possible). 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 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, or, under special circumstances, during their first semester of graduate study; foreign students 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, 333 Electrical Engineering Building (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 both the Nuclear Engineering Program Graduate Studies Office and to the Admissions Office, 130 Jesse Hall
- 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 qualifying examination, usually administered during the first semester of study.

DEGREE REQUIREMENTS: The basic 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 other backgrounds will be required to complete undergraduate courses in thermodynamics, heat and mass transfer, engineering materials and other prerequisite engineering courses, 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.

NUCLEAR POWER ENGINEERING: Two options of study exist within the power nuclear engineering master's degree program: 1)the basic nuclear engineering program (for students emphasizing fission or fusion processes) and, 2)the 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. The nuclear power engineering program is a joint electrical engineering/nuclear engineering program at the master's level. It is a non-thesis degree, requiring 30 hours, including a three-credit research project.

MEDICAL PHYSICS/NUCLEAR ENGINEERING: The master's program in medical physics emphasizes four areas of study radiology, diagnostics, nuclear medicine, radiation therapy and health physics in medical practice. Medical physics applies physics and engineering concepts and methods to the diagnosis and treatment of human disease. The curriculum consists of 38 credit hours that can be completed in two years. It requires a three-credit practicum, taken in area hospitals and a three-credit research project. Students pursuing a PhD in this option will select a suitable dissertation topic in the medical physics area.

HEALTH PHYSICS/NUCLEAR ENGINEERING: The option in nuclear engineering of health physics is devoted to the study of the protection of people and the environment from radiation and environmental contaminants.

Natural Resources
Nuclear Engineering

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 effluents from power plants). The program offers the master's degree requiring 34 hours, including a three-credit practicum, both at an operating reactor and with health physics and a three-credit thesis. The PhD degree is a research degree in nuclear engineering with emphasis in health physics.

COURSES

NUCLEAR ENGINEERING

300—Special Problems in Nuclear Engineering (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 people 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 radiations. Laboratory experiments in radiation measurements and protection. Prerequisite: instructor's consent.

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 and fusion. Prerequisites: Physics 124, concurrent with Mathematics 304.

306—Advanced Engineering Math (3) (same as Chemical Engineering 306).

310—Survey of Medical Physics and Health Physics (1-3). Provides graduates and undergraduates contact with an array of subjects, gives graduates more chance to speak on technical subjects (not required of undergraduates), helps students keep abreast of research. Prerequisite: instructor's consent.

315—Energy Systems and Resources (3) (same as Electrical and Computer Engineering 315 and Mechanical and 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.

327—Nuclear Medicine Instrumentation (3) (same as Radiologic Sciences 327).

328—Introductory Radiation Biology (3) (same as Biological Sciences 328, Radiology 328 and Veterinary Medicine and Surgery 328).

346—Introduction to Nuclear Reactor Engineering I (3) (same as Mechanical and Aerospace Engineering 346).

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 and laboratory. Prerequisite: senior standing or instructor's consent.

353—Introduction to Fusion (3). Basic plasma physics,

principles of thermonuclear fusion, plasma confinement and heating and devices. Prerequisite: senior standing in engineering or science or instructor's consent.

365—Nuclear Power Engineering (3). Nuclear reactor heat generation and removal, nuclear reactor coolants and analysis of nuclear reactor power plants. Prerequisite: Engineering 99.

369—Principles of Direct Energy Conversion (3). Principles and utilization of thermoelectric, thermionic, photovoltaic, magnetohydrodynamic generators and fuel cells. Prerequisites: Engineering 99, Mechanical and Aerospace Engineering 251 or equivalent.

379—Particulate Systems Engineering (3) (same as Chemical Engineering 379 and Mechanical and Aerospace Engineering 379). Introduction to natural and engineering particulate systems. Prerequisite: Chemical Engineering 234 or Mechanical and Aerospace Engineering 299 or equivalent.

382—Lasers and Their Applications (3) (same as Electrical and Computer Engineering 382 and Mechanical and 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 and laboratory. Prerequisite: 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 and 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. Neutron activation analysis, instrumentation and reactivity evaluation. Prerequisite: 346 or 411.

406—Clinical and Research Applications in Medical and Health Physics (1). To give the student an understanding of the range of clinical practice and medical research involving the practice and nuclear physics/engineering. Prerequisties: college calculus or equivalent, math and calculus-based physics, Nuclear Engineering 409 and Nuclear Engineering 303.

408—State Variable Methods in Automatic Control (3) (same as Chemical Engineering 408, Electrical and Computer Engineering 408 and Mechanical and 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: instructor's consent.

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. Prerequisite: 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 and transport theory. Prerequisites: 411 or 346 and 347.

421—Nuclear Pulse Analysis (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 control rod analysis. Prerequisites: 411 or 347 and 365 or instructor's consent.

434—Fracture Mechanics I (3) (same as Mechanical and Aerospace Engineering 434).

435—Physics of Diagnostic Radiology I (3) (same as Medical Physics 435). 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. Prerequisite: 409 or equivalent, or instructor's consent.

439—Clinical Physics in Radiotherapy (3). Principles and applications of radiation producing units, exposure and dose measurements, and calibration. External beam physics and parameters and application to fixed field and rotational field treatment planning. Prerequisite: Nuclear Engineering 409 or equivalent or instructor's consent.

444—Fracture and Fatigue Prevention in Engineering Practice (3) (same as Mechanical and Aerospace Engineering 444).

445—Physics of Diagnostic Radiology II (3). Physical principles, equipment and techniques of imaging with ionizing radiation, conventional tomography, xerography, computed tomography and others. Physical principles, equipment and techniques of imaging with non-ionizing radiation, thermography and ultrasound. Prerequisite: 435 or instructor's consent.

449—Clinical Physics in Radiotherapy II (3). Theory and calculational and measurement principles of external beam treatment planning, irregular field treatment planning, brachy therapy, electrons, high energy photons and future modalities. Prerequisite: 439 or instructor's consent.

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 and reactor safety. Prerequisites: 304, 411, Mathematics 307 or 323.

452—Ultrasound and Magnetic Resonance Imaging (3). The physical principles, clinical instrumentation, artifacts in images, biological effects and quality control will be discussed. Images obtained with both techniques will be presented. Prerequisites: 391, 409, 306 or equivalent.

453—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). Provide necessary background training in the area of nuclear medicine, its physical principles, statistics of radionuclide decay and highlights into the most current instrumentation to utilize this unique type of in vivo radionuclide information. Prerequisites: 306, 310, 409 or equivalent.

461—Neutron Transport Theory (3). The Boltzmann equation, general properties and solution, numerical methods of solving the transport equation and neutron thermalization and neutron spectra. Prerequisites: 412, Mathematics 305 and 307, or instructor's consent.

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 and 328.

490—Research (cr. arr.). Independent investigation in nuclear engineering to be presented as a thesis.

Nursing

School of Nursing
S235 School of Nursing Building (314)882-0277

FACULTY

Toni Sullivan, dean, professor, EdD, Columbia University

Elizabeth Geden, associate dean for research, director of graduate studies, professor, PhD, University of Missouri-Columbia

Lawrence Ganong, professor, PhD, University of Missouri-Columbia

Gerald T. Brouder, associate professor, PhD, University of Texas-Austin

Virginia Bzdek, associate professor, PhD, University of Oregon

Mary A. Manderino, associate professor, PhD, Arizona State University

Verna Rhodes, associate professor, EdSp, University of Missouri- Columbia

Barbara Shelton, associate professor, PhD, St. Louis University

Susan G. Taylor, associate professor, PhD, Catholic University

Gelene Adkins, assistant professor, PhD, University of Missouri- Columbia

Jane Armer, assistant professor, PhD, University of Rochester

Virginia Aukamp, assistant professor, PhD, University of Texas- Austin

Carole Ann Bach, assistant professor, PhD, University of Texas- Austin

Barbara Biehler, assistant ptofessor, EdD, Illinois State University

Vicki Conn, assistant professor, PhD, University of Missouri-Columbia

Julie Johnson, assistant professor, PhD, University of Texas

Alice Kuehn, assistant professor, PhD, University of Missouri- Columbia

Kay Libbus, assistant professor, PhD, University of Texas-Houston

Roxanne McDaniel, assistant professor, PhD, University of Texas-Austin

Sherry Mustapha, assistant professor, EdD, University of Kansas

Rosemary Porter, assistant professor, PhD, University of Missouri-Columbia

DEGREE: MS in nursing

The program provides preparation in adult nursing, childbearing/ childrearing family nursing, community mental health nursing and rural community health nursing with functional role preparation as educator, clinician or administrator. Primary-care preparation is provided in the family nurse practitioner and geriatric nurse practitioner areas of study. Nursing administration preparation also is available. The program is accredited by the National League for Nursing.

Upon completion of the master's program in nursing, the learner will be able to:

- examine the fields of nursing knowledge with an emphasis on nursing science
- use the professional process in the definition and solution of problems within nursing (professional, clinical, organizational)
- apply self-care deficit theory to the design,

implementation and evaluation of nursing systems using an advanced theory base relevant to the particular clinical area
- exercise nursing agency, within a defined clinical area, in situations where (a) application of theory is not well-developed, (b) required technology is not developed or is extremely complex, or (c) where predictability of outcomes is low
- design, implement and evaluate studies that are derived from self-care deficit theory
- develop agency to perform a selected role within the nursing profession and interprofessionally

Students in the School of Nursing have access to all campus libraries and the various services they provide. The new School of Nursing building is adjacent to University Hospital and Clinics, which includes the Rusk Rehabilitation 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 in the form of scholarships, fellowships, assistantships and traineeships.

Detailed information may be obtained by writing to Director of Graduate Studies, School of Nursing, Columbia, Mo. 65211.

ENTRANCE REQUIREMENTS include:
- 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 program
- 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 1,000 on the verbal and quantitative sections of the GRE. If other criteria are strong, a minimum score of 800 may be considered for admission. The GRE must have been taken within five years before application.

DEGREE REQUIREMENTS: 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

COURSES

300—Problems (1-3). Guided readings, special study and/or a practicum in an area of the student's interest or an area that the student needs to strengthen. Prerequisite: instructor's consent.

301—Special Topics in Nursing (1-3). Specialized topics in advanced nursing not available through regularly offered courses.

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.

305—Women's Health (3). An overview of women's health issues from adolescence through old age. Examines current sociocultural concerns impacting women's health and health-care services. Stresses an active role for women in promoting their own health.

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 and effect of contract law.

308—Communication Processes and Intervention (3). Communication will be explored using various theoretical frameworks appropriate to individuals and groups. Includes interpersonal learning, nature of groups, authority in groups, roles, processes, systems of groups, listening skills, decision making and conflict. Prerequisite: instructor's consent.

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.

310—Self-Care Deficit Theory I (3). Analysis, application and evaluation of the general theory of nursing, examining the theories of self-care, self-care deficit and nursing systems. Examines self-care and self-care behaviors from a historical and philosophical perspective.

311—Nursing Issues: Theoretical Correlates (3). Nursing practice disciplines are described and explained from the viewpoint of self-care deficit theory. Historical, social, economic, legal and ethical questions related to the use of this conceptual framework are identified and resolved. Prerequisite: 310 or instructor's consent.

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.

340—Concepts of Adult Nursing (3). Examine self-care deficit theory constructs relevant to adult nursing, influence of demographic variables on nursing situations, analyze major concepts significant to nursing of adults.

342—Vital Life Processes (3). Examines pathophysiology of major body systems in critically ill adults. Application of nursing theory in designing nursing systems and selecting requisite nursing technologies. Prerequisites: 310, 414.

343—Oncology Nursing (3). Specialized content and supportive techniques for the management of symptom occurence and symptom distress of adult persons with cancer; including epidemiology, carcinogenesis, prevension and detection, treatment modalities, professional and ethical issues. Prerequisite: 310 or instructor's consent.

344—Gerontic Nursing (3). Examines aging clients experiencing limitation in self-care agency. Focus on nursing systems incorporating understanding of physical, social, and psychological changes associated with advanced age. Prerequisite: 310 or instructor's consent.

351—Current Issues and Trends in Mental Health Nursing (3). Overviews existing mental health delivery system as it interfaces with mental health nursing. Emphasizes trends and issues related to nursing processes at primary, secondary and tertiary prevention levels. Prerequisite: graduate standing.

360—Rural Community Health Nursing Theories and Concepts (3). Investigates the theoretical and empirical foundations for the practice of community-health nursing in rural settings. Self-care deficit theory and related social and behavioral theories are examined. Prerequisite: 310 or concurrent.

372—Concepts of Advanced Practice (3). Examines the theoretical basis of advanced practice, including management of the work of designing and providing care. Explores current and innovative models and systems for delivery of care to people requiring expert nursing. Prerequisite: 310 or concurrent.

381—Teaching Nursing (3). Principles and methods of teaching, evaluation and curriculum construction in nursing education. Prerequisite: Educational and Counseling Psychology A301 or equivalent.

382—Nursing Administration (3). Examines organizational and leadership theories and their application to nursing service administration. Selects concepts, theories and paradigms to identify and investigate current nursing administrative practices. Role specifics of a nurse administrator are examined. Prerequisite: 472.

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. Prerequisites: 310 or concurrently and appropriate statistics.

400—Problems (1-3). Guided readings, special study and/or a practicum in an area of the student's interest or in an area that the student needs to strengthen. Prerequisite: instructor's consent.

401—Topics in Advanced Clinical Nursing (3). Specialized topics in advanced clinical nursing not available through regularly offered courses.

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.

412—Family Dynamics and Intervention (3) (same as Child and Family Development 412). Theories of family function and dysfunction, techniques of assessment and models of family intervention. Practicum with selected families.

414—Pathophysiologic Basis for Nursing (3). Pathophysiology of major systems comprising total body response to illness, focus on nursing diagnosis, influence of age and sex and management for prominent health problems, including pharmacotherapeutics. Foundation for pathophysiologic concepts relevant to nursing. Prerequisite: 310.

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 moddels from the perspective of various populations and other theories: development of procedures and protocols. Prerequisites: 310 and 415.

422—Childrearing Family Nursing (4). Concepts and techniques for advanced nursing practice with children aged 28 days through adolescence and their dependent care agents in both health promotion and health deviation on situations. Prerequisites: 310, 414 and 333.

423—Childbearing Family Nursing (4). Development of concepts and techniques for advanced nursing practice utilizing self-care deficit theory, research and issues with the developing families during childbearing. Prerequisites: 310, 414 and concurrent or 313.

431—Primary Care of Aging Families (3). Emphasis on designing and evaluating nursing systems for the primary health-care management of individuals and families during late middle age and aging. Prerequisites: 310, 333, 432 and 434.

432—Primary Care of Families with Long-Term Health Deviations (4). Emphasis on designing and evaluating nursing systems for management of individuals and families with long-term health deviations in a primary care setting. Prerequisite: 333. Concurrent: 434.

433—Primary Care of Childbearing Families (3). Emphasis on designing and evaluating nursing systems for the primary health-care management of individuals and families during the periods of childbearing and early-childhood rear-

ing. Prerequisites: 333, 310, 432 and 434.

434—Primary Care of Families with Short-Term Health Deviations (4). Emphasis on designing and evaluating nursing systems for management of individuals and families with short-term health deviations in a primary care setting. Prerequisite: 333. Concurrent: 432.

442—Nursing in Chronicity (3). Examine theoretical bases for understanding the chronic illness experience, the settings in which care is provided, the effect of chronic care on the individual and family, and ethical issues. Nursing theory relevant to the care of the ill will be analyzed and developed. Prerequisite: 310. Recommended: 414.

444—Nursing in Acute Care (3). Examines concpets and issues related to advanced nursing practice in care of adults in acute care settings, including critical care. Prerequisite: 310.

445—Nursing in Rehabilitation (3). Examines concepts needed for promotion of client function in activities of daily living in order to maximize individual capabilities and resources to foster optimal growth and functioning following debilitating illness or injury. Prerequisite: 310.

450—Research Non-Thesis in Nursing (1-6). Independent research not leading to a thesis. Written report required. Prerequisites: 310, 390.

452—Community Mental Health Nursing I (4). Focus on the development of the nurse agency as it relates to primary prevention and distributive nursing care in the maintenance and promotion of mental health of individuals, families and groups.

454—Nursing in Psychosocial Crises (4). Focus on nurse agency as it is related to secondary prevention with people experiencing critical levels of psychosocial stress. Emphasizes crisis intervention theory and methodology within the framework of self-care deficit theory. Prerequisite: 310.

460—Health Promotion in the Rural Community (4). Development of nurse agency as it relates to promotion of health of individuals, families and groups in a selected rural community. Practicum includes community assessment and health promotion program implementation. Prerequisites: 310 and 360.

470—Research Practicum (1-6). Selected research activities in conjunction with ongoing research programs of faculty. Written report required. Prerequisites: 390, instructor's consent.

472—Clinical Management of Patient Care (3). This course is for nurse managers at the management level where there is a complete responsibility for limited areas in nursing. The focus is on management of nursing units which demonstrate quality nursing practice. Prerequisite: 372.

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: 310, 311, 390 and instructor's consent.

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.

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: 382.

490—Research Thesis in Nursing (1-6). Independent research aimed at discovery or development of elements or relationships derived from a nursing theory. Prerequisites: 310 and 390.

495—Description and Measurement of 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—Description and Measurement of 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 and 495.

Nutrition Area Program

Graduate School
217 Gwynn Hall (314)882-9686

FACULTY

G. M. Hill, director of graduate studies, associate professor of human nutrition, PhD, Michigan State University

J. Malcolm Asplund, professor of animal science, PhD, University of Wisconsin

Margaret A. Flynn, professor emeritus of human nutrition/family and community medicine, PhD, University of Missouri-Columbia

Dennis T. Gordon, professor of food science and nutrition, PhD, University of Connecticut

Laura S. Hillman, professor of child health, MD, Yale Medical School

Boyd L. O'Dell, professor emeritus of biochemistry, PhD, University of Missouri-Columbia

John A. Paterson, professor of animal sciences, PhD, University of Nebraska

James E. Savage, professor emeritus of animal science, PhD, University of Missouri-Columbia

R. A. Sunde, professor of human nutrition, PhD, University of Wisconsin

Trygve L. Veum, professor of animal science, PhD, Cornell University

James E. Williams, professor of animal sciences, PhD, University of West Virginia

Robert L. Wixom, professor of biochemistry, PhD, University of Illinois

Richard Dowdy, associate professor of human nutrition, PhD, North Carolina State University-Raleigh

Jeffre D. Firman, assistant professor of animal sciences, PhD, University of Maryland

Kevin L. Fritsche, assistant professor of animal sciences, PhD, University of Illinois

Monte S. Kerley, assistant professor of animal sciences, PhD, University of Illinois

Ruth S. MacDonald, assistant professor of food science and nutrition, PhD, University of Minnesota

G. A. Weisman, assistant professor of food science and nutrition, PhD, University of Nebraska

DEGREES: MS and PhD in nutrition area program

The interdisciplinary area program in nutrition is designed to provide a foundation in many scientific aspects of nutrition. This is accomplished by core courses on which a student builds a graduate program. Research is conducted on the Columbia campus in the departments of animal science, dairy science, food science and nutrition and human nutrition and foods as well as in the School of Medicine.

Laboratories and animal facilities for all species enable students to conduct basic and applied nutrition research. Radioactive and stable isotopes are used in many laboratories as well as produced and used at the Missouri University Research Reactor (MURR). In addition to the advanced facilities at MURR, a whole body radiation detector facility is available.

All major journals in the field of nutrition are in the libraries on campus.

The U.S. Department of Agriculture, Public Health Service and Energy Research and Development Administration, as well as state and private sources, provide research support. Fellowships and assistantships are available in the Area as well as from the involved departments. Apply to the director of graduate studies, nutrition area program, or to the department in which you plan to do nutrition research.

COURSES

NUTRITION

335—Nutrition During the Life Cycle (3) (same as Human Nutrition and Foods 335).

402—Animal Nutrition (3) (same as Animal Science 402).

410—Seminar (1).

415—Nutritional Endocrinology (2) (same as Food Science and Nutrition 415).

432—Ruminant Nutrition (3) (same as Animal Science 432).

440—Bioenergetics (3) (same as Dairy Science 440).

450—Investigations in Experimental Nutrition (1-6). Written report required.

490—Research (cr. arr.). Investigation in any area of experimental nutrition. Thesis required.

Occupational Therapy

School of Health Related Professions
126 Lewis Hall (314)882-3988

COURSES

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.

220—Human Anatomy (7). Gross structure and neuroanatomy of a human body, with dissection of extremities, back, head, neck, abdomen and thorax.

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.

331—Psychopathology (3). Focus on the major theories in etiology of psychosocial dysfunction as applicable to occupational therapy, review of classification and characteristics of pathological syndromes.

Parks, Recreation and Tourism

School of Natural Resources
624 Clark Hall (314)882-7086

See Natural Resources for description of programs.

Pathology

School of Medicine
M263Medical Science Building (314)882-1201

FACULTY

John F. Townsend, chairman, professor, MD, University of Missouri-Columbia

Arlene P. Martin, director of graduate studies, professor, PhD, University of Rochester

Edward H. Adelstein, associate professor, DVM, MD, MS, University of Missouri-Columbia

Alan M. Luger, associate professor, MD, Duke University

Linda E. Spollen, associate professor, MD, Kansas University

Charles W. Caldwell, assistant professor, MD, PhD, University of Missouri-Columbia

Daniel S. Smith, assistant professor, MD, Indiana University

DEGREE: MS in pathology

INTERDISCIPLINARY AREA DEGREE: PhD in pathology

The Department of Pathology in the School of Medicine offers graduate work leading to the master of science degree. The department, together with the Department of Plant Pathology in the College of Agriculture, Food and Natural Resources and the Department of Veterinary Pathology in the College of Veterinary Medicine, offers a PhD in the Pathology 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.

The MS degree is designed primarily to prepare students for teaching in medical technology, supervisory roles in clinical laboratories, and concurrent with studies leading to an MD degree, offers greater in depth study in pathology.

DEGREE REQUIREMENTS: Admission to candidacy in the master's program is limited to those who hold a baccalaureate degree from an accredited college or university. GRE general test scores should be submitted.

Requirements for the degree include:

- 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
- no more than 12 hours of research, problems or special investigations culminating in a thesis
- satisfactory performance on a final examination. 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.

COURSES

310—General Pathology (cr. arr.). Pathologic mechanisms of disease. Prerequisite: instructor's consent.

311—General Pathology Laboratory (cr. arr.). Gross and microscopic applied study and laboratory assessment of basic pathological disease mechanisms. Prerequisite: instructor's consent.

312—Advanced Pathology (cr. arr.). Study of gross, microscopic and clinical laboratory pathology of major human-organ systems. Prerequisite: instructor's consent.

313—Advanced Pathology Laboratory (cr. arr.). Prerequisite: instructor's consent.

404—Advanced Pathology (cr. arr.). Graduate course designed to meet the needs, qualifications and interests of the student. Prerequisite: instructor's consent.

450—Research (cr. arr.). Opportunities for research in pharmacology, not leading to dissertation.

491—Research (cr. arr.). Research for qualified graduate students, leading to dissertation.

Pathology Area Program

Graduate School
106 Waters Hall (314)882-2643

FACULTY

Steven G. Pueppke, area chairman, professor of plant pathology, PhD, Cornell University

Gary S. Johnson, director of graduate studies, associate professor of veterinary pathology, DVM, Kansas State University, PhD, University of Minnesota

John F. Townsend, professor of pathology, MD, University of Missouri-Columbia

Om P. Sehgal, professor of plant pathology, PhD, University of Wisconsin

Merton F. Brown Jr., professor of plant pathology, PhD, University of Iowa

Oscar H. Calvert, professor emeritus of plant pathology, PhD, University of Wisconsin

Victor H. Dropkin, professor emeritus of plant pathology, PhD, University of Chicago

LaMont W. Gaston, professor of pathology, MD, University of Kansas

Robert N. Goodman, professor of plant pathology, PhD, University of Missouri-Columbia

Loren D. Kintner, professor emeritus of veterinary pathology, DVM, The Ohio State University, MS, University of Missouri-Columbia

Arlene P. Martin, professor of pathology/biochemistry, PhD, Rochester University

Daniel F. Millikan, professor emeritus of plant pathology, PhD, University of Missouri-Columbia

Lawrence G. Morehouse, professor emeritus of veterinary pathology, DVM, Kansas State University, PhD, Purdue University

Stuart L. Nelson, professor emeritus of veterinary pathology, DVM, The Ohio State University, PhD, Purdue University

Anton Novacky, professor of plant pathology, PhD, Czechoslavakia Academy of Sciences

Leroy D. Olson, professor of veterinary pathology, DVM, University of Minnesota, PhD, Purdue University

Einar W. Plam, professor of plant pathology, PhD, North Dakota State University

Donald A. Schmidt, professor of veterinary pathology, DVM, Michigan State University

Joseph E. Wagner, professor of veterinary pathology, DVM, Iowa State University, PhD, University of Illinois

Jack R. Wallin, professor emeritus of plant pathology, PhD, Iowa State University

Thomas D. Wyllie, professor of plant pathology, PhD, University of Minnesota

Edward H. Adelstein, associate professor of pathology, DVM, MD, MS, University of Missouri-Columbia

Arthur L. Karr Jr., associate professor of plant pathology, PhD, Colorado University

Darrell A. Kinden, associate professor of veterinary pathology, PhD, University of Missouri-Columbia

Alan Luger, associate professor of pathology, MD, Duke University

Ranadhir Mitra, associate professor of pathology, PhD, University of Missouri-Columbia

Chada S. Reddy, associate professor of veterinary biomedical sciences, BVSc Andhra Pradesh Agr. University, PhD, University of Mississippi

Larry P. Thornburg, associate professor of veterinary pathology, DVM, Texas A&M University, PhD, North Carolina-Chapel Hill

Linda L. Collier, associate professor of veterinary pathology, DVM, Cornell University, PhD, Washington State University

James A. Wrather, associate professor of plant pathology, PhD, University of Missouri-Columbia

DEGREE: PhD in pathology area program

The PhD area program in pathology is jointly staffed by faculty from the Departments of Pathology (School of Medicine), Veterinary Pathology (College of Veterinary Medicine) and Plant Pathology (College of Agriculture).

The program is designed to provide students with the opportunity to examine and use research concepts and methods indigenous or specific to each of the three areas of pathology. In its approach to comparative pathology, the program allows the opportunity to obtain training in in-depth studies of disease mechanisms or processes in various host species.

Joint committee appointments and cooperative efforts in course offerings create an atmosphere for meaningful interdisciplinary dialogue and research cooperation among graduate students and faculty of the existing pathology departments. This is further implemented through an advisory committee composed of one member from each pathology department.

A PhD candidate may choose a plan of research to take advantage of the interests and specialties of the various PhD advisers. Among these research areas are ultrastructure research, membrane transport systems, enzymology, electron transport systems in tissues, oncology, host cell-pathogen relationships, epidemiology, crop pest management and pathogenesis of avian and mammalian disease (companion animal, food-producing animal and spontaneous disease of laboratory animals).

In addition to standard equipment suitable for research in each pathology area, special items in the various departments include six electron microscopes, chromatographic equipment (gas-liquid, column, paper, thin-layer and HPLC), spectrophotometers, low-high speed ultracentrifuges, electrophoresis apparatuses, Warburg respirometers, liquid scintillation and thin window radioisotope counters, ultra-microtomes and a radiometer blood gas analyzer.

Facilities also include necropsy and clinical pathology laboratories for supportive course work (medical and veterinary pathology), research laboratories in medical, plant and veterinary medical pathology and two research farms.

Various stipends are available, including teaching assistantships and postdoctoral fellowships. Write to the chairman in the specific pathology department for application forms.

DEGREE REQUIREMENTS: To be accepted for advisement in the area program in pathology, an applicant should hold the MS degree in plant pathology or a closely related field of biological science, or the MD, DVM or DDS.

An applicant should take the general test of the GRE before entering Graduate School or during the first semester of graduate study (applicants for plant pathology also should complete the GRE subject test in biology, furthermore, students must pass a qualifying examination for admission to candidacy.

Students with a GPA of less than 3.0 (A=4.0) or combined verbal and quantitative GRE general test below 1,100 could only be admitted under probationary status. Such admission would require approval by the executive committee of the area program.

A student's course of study includes a core curriculum, which must be completed before graduation. These subjects are not requirements for admission. If there exists adequate evidence

of previous work in these areas, or their equivalents, the courses need not be repeated.

The core curriculum should include a basic course in microbiology and an advanced course in virology, bacteriology, mycology, or immunology, depending on the interests of the student, an introductory course and two advanced courses in biochemistry, or one advanced course in biochemistry and a semester of physical chemistry, one basic and one advanced course in genetics, Mathematics 80 or an acceptable equivalent, one course in genetics and one course in scientific instrumentation. The student is referred to the chairman of the specific department for additional information on course curriculum including minimum pathology course requirements.

Abilities developed in the preparation of the required dissertation should include logical thought regarding technical aspects of pathology and areas to which it relates, planning and conducting of independent objective research investigations and the ability to communicate scientific results in writing.

Peace Studies

College of Arts and Science
101 Professional Bldg. (314)882-7565

COURSES

200—Principles of American Journalism (3). (same as Journalism 200). Requires approval of the dean of the School of Journalism.

201—Topics (2-3). Organized study of selected topics in Peace Studies. Subjects and credit hours may vary from semester to semester. Prerequisite: sophomore standing.

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 Ghandi and non-violent tradition in America Europe and the Third World. Prerequisite: sophomore standing.

261—The Third World an Anthropological Perspective (3) (same as Anthropology 260).

280—Internship (1-3). Students work in a peace-related agency or institution for one to three credit hours. Repeatable for maximum of six hours. Prerequisite: departmental consent. S/U graded only.

288—Senior Thesis (3). Senior essay on a peace studies topic requiring major research. Prerequisites: 50 and senior standing.

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).

341—Sino-Soviet Conflict (3) (same as History 341).

350—Readings in Peace Studies (1-3). Students may receive one to three 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 six hours. Prerequisite: instructor's consent.

354—Political Sociology (3) (same as Sociology 354).

355—Western Europe's Foreign Policy (3) (same as Political Science 355).

360—Economic Development (3). Process of economic development examined. Structural transformation of the economy analyzed, with problems of backward economics highlighted. Prerequisites: 229 and 251 or 351.

370—American Foreign Policy from Colonial Times to 1898 (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, 1898 to Present (3) (same as History 373).

Pharmacology

School of Medicine
M517B Medical Sciences Building (314)882-7186

FACULTY

Hyun Dju Kim, chairman, professor, PhD, Duke University

H. Richard Adams, professor, PhD, University of Pittsburgh

Tihamer Z. Csaky, professor emeritus, MD, University of Budapest

Leonard R. Forte, professor, PhD, Vanderbilt University

Robert R. Russell, professor emeritus, PhD, University of Missouri-Columbia

Albert Y. Sun, professor, PhD, Oregon State University

Walter Wosilait, professor emeritus, PhD, Johns Hopkins University

Keith Byington, associate professor, PhD, University of South Dakota

Shivendra D. Shukla, associate professor, PhD, University of Liverpool

Jesse W. Bowen, assistant professor, PhD, University of Texas Health Sciences Center-San Antonio

Hattie Gresham, assistant professor, PhD, Vanderbilt University

Stephen P. Halenda, assistant professor, PhD, Medical College of Virginia

Marilyn R. James-Kracke, assistant professor, PhD, University of British Columbia

Robert Lim, assistant professor, PhD, University of Washington- Seattle

John T. Turner, assistant professor, PhD, University of Missouri- Columbia

Ronald Walkenbach, assistant professor, PhD, University of Missouri-Columbia

Animesh Dhar, research assistant professor, PhD, University of Calcutta

Jeong H. Im, research assistant professor, PhD, University of North Carolina

Fatma F. Oldfield, research assistant professor, PhD, University of Leicester

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. Emphasis is in the areas of cellular and molecular pharmacology. The major fields of research include neuropharmacology, drug metabolism, pharmacokinetics, membrane transport, hormone-receptor mechanisms, receptor regulation mechanisms, endocrine pharmacology and renal pharmacology. Cooperative interactions exist with other departments in the School of Medicine, including basic science departments such as biochemistry, physiology and microbiology, as well as various clinical departments. There also are interactions with the Truman Veterans Hospital, the Dalton 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 an opportunity for training in many areas of pharmacology.

Applicants for an advanced degree should have a 3.0 (A=4.0) or higher GPA 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. Within the limits of the department's resources, research assistantships are available to qualified graduate students who are candidates for the PhD degree in pharmacology. Students may begin their program at the beginning of the fall, winter or summer sessions. In general, applications should be received six months before the desired admission date. Women and minorities are encouraged to apply.

Additional information can be obtained from the Director of Graduate Admissions, Department of Pharmacology, M517B Medical Sciences Building, Columbia, Mo. 65212.

DEGREE PROGRAMS: Admission to the PhD program is open to students with backgrounds in biology and chemistry, and who have an understanding of mathematics and physics. 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 acceptable, accredited college is required.

The program of study includes one or two years of course work in biochemistry, physiology and related areas, as well as basic and advanced courses in various aspects of pharmacology.

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 dissertation. 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 on the dissertation and

comply with all University and departmental regulations governing the PhD degree.

Philosophy

College of Arts and Science
438 General Classroom Building (314)882-2871

FACULTY

Peter Markie, chairman, professor, PhD, University of Massachusetts
Joseph Bien, director of graduate studies, professor, PhD, University of Paris
William Bondeson, professor, PhD, University of Chicago
Arthur Berndtson, professor emeritus, PhD, University of Chicago
Bina Gupta, associate professor, PhD, Southern Illinois University
John Kultgen, professor, PhD, University of Chicago
Donald E. Sievert, professor, PhD, University of Iowa
Alexander von Schoenborn, associate professor, PhD, Tulane University
Paul Weirich, associate professor, PhD, University of California- Los Angeles

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. Teaching at least one of the underclass courses is normally a prerequisite for a PhD. 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 philosophy department deadline of February 15.

Application forms and information may be obtained from the Director of Graduate Studies, Philosophy Department, 488 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 on the basis of 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 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 in the department 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, to figures and to 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). Philosophic thought from Thales through Plotinus, emphasizing Plato and Aristotle. 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). Major philosophical theories developed since the turn of the century. Attention is given to such philosophers as Dewey, Husserl, Russell and Wittgenstein. Prerequisite: sophomore standing.

212—Existentialism (3). Existential ideas in Kierkegaard, Nietzsche, Heidegger, Jaspers, Sartre and Tillich. Prerequisite: sophomore standing.

213—Political and Social Philosophy (3) (same as Peace Studies 325). Examination through classical texts of man's relationship to the state and his relationship to both state and society in terms of such concepts as contract theory, general will, alienation, individualism and collectivism. 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 through case studies, legal opinions and philosophical analysis. Prerequisite: sophomore standing.

220—Comparative Feminist Ideologies (3) (same as Women Studies 220).

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.

235—Philosophy and Language (3) (same as Linguistics 235). Truth, meaning, reference, description, names, metaphor, treated in terms of speech acts, possible worlds, propositional attitudes and private language. Prerequisite: junior standing.

240—Themes in Philosophy of Psychology (3). Basic philosophical ideas in major figures and schools of modern western psychology. Themes may include the nature of self and mind, foundations of ethics and religion, meaning of sexuality and gender. Prerequisite: sophomore standing.

298—Honors I (3). Special work for honors candidates.

299—Honors II (3). Special work for honors candidates.

301—Topics (cr. arr.). 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—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.

314—Symbolic Logic (3) (same as Linguistics 314). Fundamental operations in variety of recent systems of logic using symbolic techniques. Prerequisite: junior standing.

317—Aesthetics (3). Typical components of art, theories of art as representation, form and expression and the relation of art to value. Prerequisite: junior standing.

318—Advanced Symbolic Logic (3). Analyzes formal systems with respect to such properties as consistency and completeness. Prerequisite: 314.

320—Philosophy of Science (3). Critical analysis of methods and presuppositions of science. Prerequisites: junior standing and 10 hours of science.

322—Philosophy of Behavioral and Social Science (3) (same as Peace Studies 322). Nature of the social sciences, their relation to natural science and problems of value and social control. Prerequisites: junior standing and 10 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). Examines problems and issues in the philosophy of mind, focusing on the works of such recent philosophers as Ryle, Strawson, Hampshire and Wittgenstein. Prerequisite: junior standing.

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, 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.

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 and Aurobindo. Prerequisite: junior standing.

366—Theories of Ethics (3). Approaches to problems of ethics, the nature of moral obligation, the nature of good and evil and the nature of the good life. Mill, Hume and Kant are among the philosophers considered. Prerequisite: junior standing.

390—Senior Seminar (3). A capstone course required of an only open to senior philosophy majors. Course content will vary, depending on the professor teaching the course and the interests of the respective senior philosophy major.

405—Teaching of Philosophy (1). Objectives, planning and conducting class, testing and grading resolution of problems, for courses in philosophy. Critique students' performance as teachers.

410—Seminar (3). Special topics. May be repeated for credit.

411—Ethical Theory (3). Classical and 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, appearance and reality, causality, space and time, God, Nature and 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 with emphasis on recent scholarship.

423—Aristotle (3). Advanced studies in Aristotle with emphasis on recent scholarship.

430—The Rationalists (3). Interpretation and evaluation of major works of Descartes, Leibniz and 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.

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 (cr. arr.). Research not leading to thesis.

456—Whitehead (3). Process and Reality and other works. Contributions to metaphysics, theology, epistemology and philosophy of science.

457—Russell and Wittgenstein (3). Each initially defends, but then rejects logical atomism. Metaphysical and epistemological themes of such intellectual phases and shifts of one or both philosophers.

458—Heidegger (3). Being and Time historical context, meaning and cohesion of its claims, critical assessment of them.

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.

472—Political Philosophy (3). Selected topics in social and political philosophy.

473—Philosophy of Science (3). Nature of scientific knowledge, observation and theory, cosmological implications of natural science, distinctive features of social and behavioral science.

474—Seminar in Logic (3). Topics in the history and theory of logic.

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.

490—Research (cr.arr.). Work toward preparation of thesis or dissertation.

Physics and Astronomy

College of Arts and Science
223 Physics Building (314)882-3335

FACULTY

Henry W. White, chairman, professor, PhD, University of California-Riverside

Brian DeFacio, director of graduate studies, professor, PhD, Texas A&M University

H. R. Chandrasekhar, professor, PhD, Purdue University

Meera Chandrasekhar, professor, PhD, Brown University

Newell S. Gingrich, professor emeritus, PhD, University of Chicago

Eugene B. Hensley, professor emeritus, PhD, University of Missouri-Columbia

Louis V. Holroyd, professor emeritus, PhD, University of Notre Dame

Patricia Plummer, professor, PhD, University of Texas

James J. Rhyne, professor, PhD, Iowa State University

Paul W. Schmidt, professor, PhD, University of Wisconsin

Guy Schupp, professor, PhD, Iowa State University

Haskell Taub, professor, PhD, Cornell University

Clifford W. Tompson, professor, PhD, University of Missouri- Columbia

Samuel A. Werner, professor, PhD, University of Michigan

Joseph E. Willett, professor, PhD, University of Missouri-Columbia

David L. Cowan, associate professor, PhD, University of Wisconsin

Terry W. Edwards, associate professor, PhD, University of Wisconsin

Justin C. Huang, associate professor, PhD, Michigan State University

Bahram Mashhoon, associate professor, PhD, Princeton University

Charles J. Peterson, associate professor, PhD, University of California-Berkeley

Peter Pfeifer, associate professor, PhD, ETH Switzerland

Edward Conrad, assistant professor, PhD, University of Wisconsin

Sashi Satpathy, assistant professor, PhD, University of Illinois

Giovanni Vignale, assistant professor, PhD, Northwestern University

ADJUNCT FACULTY

William Yelon, adjunct professor of physics, group leader, Missouri University Research Reactor, PhD, Carnegie-Mellon University

Ronald Berliner, adjunct associate professor of physics, senior research scientist, Missouri University Research Reactor, PhD, University of Illinois

John Farmer, adjunct associate professor of physics, program director, Missouri University Research Reactor, PhD, Kansas State University

Helmut Kaiser, adjunct associate professor of physics, Senior research scientist, Missouri University Research Reactor, PhD, Technical University-Vienna, Austria

David Mildner, adjunct associate professor of physics, senior research scientist, Missouri University Research Reactor, PhD, University of Michigan

DEGREES: MS and PhD in physics

RESEARCH PROGRAM AREAS AND STAFF

Theoretical

Astrophysics — Professor Edwards
Mathematical Physics — Professor DeFacio
Particles and Fields (Gravitation) — Professors Mashhoon and Huang
Plasmas — Professor Willett
Solid State — Professors Satpathy and Vignale
Surface Physics — Professor Pfeifer

Experimental

Chemical Physics — Professor Plummer
Condensed Matter — Professors Cowan, White and Taub
Mossbauer Scattering — Professor Schupp
Neutron Scattering — Professors Werner and Tompson
Observational Astronomy — Professor Peterson
Optical Spectroscopy — Professor H. R. Chandrasekhar and M. Chandrasekhar
Small-angle X-ray scattering — Professor Schmidt
Solid State Physics — Professor Werner
Surface Physics — Professor Conrad

DEGREE REQUIREMENTS: The master of science (physical science) degree is designed primarily for teachers and emphasizes broad training in physics, chemistry and mathematics. For degree requirements, refer to **Master's Degrees** in this catalog.

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.

Graduate students in physics are expected to take a full and active part in departmental ac-

tivities. Participation in research programs, departmental lectures and colloquia are considered a normal part of a graduate program.

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 written and oral comprehensive examination. At the time of the examination, the candidate must have completed (or be currently enrolled in) all of the courses in the PhD program. In special cases, the 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

201—Introduction to Modern Astrophysics (3) (same as Astronomy 201).

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

225—Fundamentals of Physics for High School Teachers I (2). Survey mechanics, heat and sound for the high school teacher. Special reference to fundamental concepts, demonstrations, use of equipment and problems.

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.

296—Honors Problems in Physics (cr. arr.).

300—Problems (cr. arr.). 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: 176 or instructor's consent, departmental consent for repetition.

304—Principles of Physical Measurements (3). Analyzes direct/ alternating current circuits. Measures solid, liquid properties of materials of current research interest. Uses computer to analyze data. One lecture and two laboratories weekly. Prerequisites: Mathematics 175, 201 or concurrently.

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 weekly. Prerequisite: 304 or instructor's consent.

310—Electricity and Magnetism I (3). Mathematical preliminaries. Properties of charge distributions at rest and in motion, the field concept and introduces electromagnetic radiation. Prerequisites: 314 and Mathematics 201 or concurrently.

311—Light and Modern Optics (4). Principles of geometrical and physical optics. Coherent radiation, lasers. Three classes weekly, six three-hour laboratories during the semester. Prerequisite: Mathematics 175.

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: 215.

313—Electricity and Magnetism II (3). Application of Maxwell's equations. Prerequisite: 310.

314—Mechanics (3). Development of fundamental concepts and principles of mechanics using mathematical methods. Many problems used. Prerequisite: Mathematics 201 or concurrently.

320—Observational Astronomy (3) (same as Astronomy 320). Elements of astronomical observational techniques and procedures for reduction of astronomical data and theory of the photographic plate. Emphasis on development of observing skills through use of the telescope. Prerequisite: 201 or equivalent.

335—Galactic Astronomy (3) (same as Astronomy 335).

340—Extragalactic Astronomy (3) (same as Astronomy 340).

370—Introduction to Methods in Mathematical Physics (3). Introduces mathematical methods and theories of physics. Topics usually covered are complex analysis, partial differential equations, integral equations and tensor analysis. Prerequisites: Mathematics 304.

375—Computational Methods in Physics (3). Use of modern computational techniques in solving a 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, Schroedinger equation and I-D problems, operators and eigen functions and spherically symmetric systems. Prerequisite: Mathematics 304.

381—Introduction to Quantum Mechanics II (3). Scattering theory, matrix mechanics, angular momentum and spin, perturbation theory and identical particles. Prerequisite: 380.

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 (cr. arr.). Laboratory work involving study of literature of special experiments in physics. Introduces research methods.

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 three 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. Prerequisite: 380 or equivalent.

416—Condensed Matter Physics II (3). Continuation of 415. Mechanical, thermal, optical and magnetic properties of solids. Prerequisite: 415.

420—Nuclear Physics I (3). Reviews of quantum mechanics and units, forms of radiation, radiation detectors, spacetime symmetries, internal symmetries, nuclear structure and form factors, low-energy nuclear two-body potential, meson physics, high-energy quark models, low-energy nuclear models, recent developments. Prerequisite: 381 or equivalent.

421—Nuclear Physics II (3). Selected topics in nuclear physics, including angular momentum and the nuclear shell model, rearrangement collision theory and the coupled channel optical mode. May be elected twice. Prerequisite: 420.

425—Small-Angle Scattering of X-rays (1-3). Theory and applications of the small-angle scattering of X-rays and neutrons. Review of the Basic theory of scattering from systems of independent and interacting scatterers. Summary of experimental techniques. Methods for correction and analysis of data. Comparison of x-ray and neutron small-angle scattering. Applications in biology, materials science,

Philosophy Physics and Astronomy

and other fields. Prerequisite: 462 or consent of instructor.

432—Topics in Astronomy and Astrophysics: Relativity and Gravitation II (3) (same as Astronomy 432). Introduction to gravitational collapse, black holes, gravitational waves, cosmological models, and other astrophysical consequences of the general theory of relativity. Experimental basis of the theory of gravitation, including the gravitationally-induced quantum interference of neutrons. 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 and experimental techniques discussed. Prerequisite: 415.

445—Plasma Physics (3). Single particle motion, plasma kinetic theory, magnetohydrodynamics and other fluid theories, waves in unmagnetized plasmas, transport phenomena, instabilities, controlled fusion. Prerequisite: consent of instructor.

450—Research (cr. arr.). Selected experiments in advanced physics or selected topics in advanced reading. Report required. Does not lead to dissertation.

455—Stellar Atmospheres (3) (same as Astronomy 455).

461—Classical Mechanics (3). The interplay of dynamics and symmetry, Hamilton's principle and Noether's theorem, Lagrangian, Hamiltonian and Hamilton-Jacobi theories of mechanics. Mechanics in special relativity. Rigid body motion, small oscillations, canonical transformations and fields as continuous mechanical systems. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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. Prerequisite: 370 or instructor's consent.

468—Thermodynamics and Statistical Mechanics (3). Thermodynamics as applied in physics and chemistry, laws of distribution and 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 perturbation theory. Prerequisite: 461.

472—Quantum Mechanics II (3). More perturbation theory, variational methods, semi-classical methods and application to radiation theory, scattering theory, linear response theory and rudiments of relativistic quantum mechanics including the Klein-Gordan equation and the Dirac equation. Prerequisite: 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-Diagramatic formulation of quantum electrodynamics, Scattering of

electrons and positions, Introduction to radiactive 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 twice.

482—Relativity and Gravitation (3). Special and general theories of relativity. Discussion of accelerated observers and the principle of equivalence. Einstein's gravitational field equations, black holes, gravitational waves and cosmology. Prerequisites: 461 and 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 consent of instructor.

490—Research (cr. arr.). Work for preparation of dissertation for master's or doctoral degree.

ASTRONOMY

201—Introduction to Modern Astrophysics (3) (same as Physics 201). Elements of solar system, stellar and galactic astrophysics. Interpretation of observations and physical conditions of various astronomical objects, including planets, stars, gaseous nebulae and galaxies. Prerequisites: Physics 124 and Mathematics 201.

300—Problems (cr. arr.). Special studies in astronomy covering 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. Emphasis on development of observing skills through use of the facilities of Baker Observatory. Prerequisite: 201 or equivalent.

335—Galactic Astronomy (3) (same as Physics 335). Reviews physical properties of stars, investigates distribution and motion of stars in space, structure of our galaxy, galactic and star cluster dynamics. Prerequisites: 201, Physics 314 or instructor's consent.

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.

432—Topics in Astronomy and Astrophysics: Relativity and Gravitation II (3) (same as Physics 432). Introduction to gravitational collapse, black holes, gravitational waves, cosmological models, and other astrophysical consequences of the general theory of relativity. Experiemental basis of the theory of gravitation, including the gravitationally-induced quantum interference of neutrons. Prerequisite: instructor's consent.

Physiology

School of Medicine
MA415 Medical Sciences Building (314)882-4957

FACULTY

Allan W. Jones, chairman, professor, PhD, University of Pennsylvania

Don H. Blount, director of graduate studies, professor, PhD, University of Missouri-Columbia

Douglas M. Griggs Jr., professor, MD, University of Virginia

James O. Davis, professor emeritus, MD, Washington University- St. Louis, PhD, University of Missouri-Columbia

E. Lee Forker, professor, MD, University of Pittsburgh

Dean Franklin, professor emeritus, Dalton Research Center

J. Alan Johnson, professor, PhD, University of Indiana

Dallas K. Meyer, professor emeritus, PhD, University of Missouri-Columbia

Wesley D. Platner, professor emeritus, PhD, University of Missouri-Columbia

Michael J. Rovetto, professor, PhD, University of Virginia

Judson D. Sheridan, professor, graduate dean and vice provost for research, DPhil, Oxford University, England

Donald H. York, professor, PhD, Monash University, Australia

Marvin L. Zatzman, professor, PhD, The Ohio State University

Ronald H. Freeman, associate professor, PhD, University of Indiana

Thomas W. Hurley, associate professor, PhD, Duke University

Virginia H. Huxley, associate professor, PhD, University of Virginia

M. Harold Laughlin, associate professor, PhD, University of Iowa

Daniel Villarreal, associate professor, MD, The National University of Mexico

Janet L. Parker, research associate professor, PhD, Michigan State University

James O. Bullock, assistant professor, PhD, University of Chicago

Lene Holland, assistant professor, PhD, University of California-San Francisco

Mark A. Milanick, assistant professor, PhD, University of Chicago

Michael S. Sturek, assistant professor, PhD, University of Iowa

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 a professional student capable of developing new knowledge through independent research and 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 in courses offered by the department. Such experience contributes to professional maturity and reinforces a sense of collegiality among 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, endocrine, gastrointestinal and environmental 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, central nervous system integration of motor control, energy production and metabolism in normal and diseased hearts, cardiogenic shock, liver and pancreatic function and hormonal induction of genetic transciptions.

Departmental members maintain research laboratories on the fourth floor of the Medical Sciences Building, in the Truman Veterans Hospital, in the Dalton Research Center and in the College of Veterinary Medicine Equine Center. The laboratories have a 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, analog and digital computers, recording spectrophotometers, environmental chambers and other equipment for accurate analysis of physiological information. General service facilities also in use at MU are those for animal care, the nuclear 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 letter of recommendation are required from individuals knowledgeable about the student's academic capabilities. The GRE must have been taken within the last four years and the scores must be 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

desiring 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 must be in 400-level courses and not more that 12 may be in research. There is no language requirement for the MS degree. The typical candidate will take 305 (10 hours), biochemistry (five hours), statistics (three hours) and other courses the adviser designates as necessary to give breadth to the program or to remedy deficiencies in the student's background. The program, of necessity, frequently exceeds the minimum 30 hours. The candidate must submit a thesis and defend it in an oral examination.

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) beyond the baccalaureate degree. The applicant must pass qualifying examinations given by the faculty at the end of the first year. Then the candidate:

- completes the program of study approved by the candidate's planning committee
- passes a comprehensive examination in mammalian physiology and related fields deemed essential by the examining committee
- completes a meritorious and original research project for the dissertation

FINANCIAL SUPPORT for qualified graduate students is available from a number of 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. In addition, several students are supported by staff research grants. The departmental director of graduate studies should be contacted for information on entrance to the graduate program in physiology and sources of financial support. A booklet is available describing research interests and activities in the department.

COURSES

201—Elements of Physiology (5). Beginning course for upperclass and graduate students designed to cover the basic functional aspects of all systems of the body. Prerequisite: five hours general zoology or equivalent.

250—Medical Physiology (7). Functional survey of the organ systems of man, with special emphasis on the physiological basis of medical practice. Laboratory illustrates basic principles of physiology with emphasis on experimental design and data interpretation. Medical students only.

300—Problems (1-3). We have requests from undergraduate students for a problems course that 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.

305—Mammalian Physiology (6-10). Graduate-level course on the physiology of the major organ systems of mammals, with strong emphasis on physiological principles. Laboratory illustrates basic physiological concepts and design and interpretation of physiological experiments. Prerequisite: instructor's consent.

325—Medical Neurophysiology (3). Aspects of central nervous system function; emphasis on human pathophysiology. Prerequisites: 201 or 250 or Veterinary Anatomy-Physiology 420 and instructor's consent.

400—Problems (cr. arr.). Individual problems in physiology are assigned to expand previous work or an introduction to research.

410—Seminar (1). Reviews current literature on physiological topics.

418—Advanced Mammalian Physiology (3). Critical study of current status of various topics in mammalian physiology. Prerequisite: instructor's consent.

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 or Veterinary Physiology, 220, 221 or Biological Sciences 371 or equivalent.

425—Advanced Systems Neurophysiology (3). A detailed analysis of sensory-motor systems in the human and primate central nervous system, using current theories of motor control. Prerequisites: Neuroscience I or Physiology 325 and instructor's consent.

430—Cardiovascular Physiology (3). Covers important aspects of the cardiovascular system, with emphasis on recent developments. Prerequisite: 305 or Veterinary Anatomy-Physiology 220 and 221 or equivalent.

439—Renal Physiology (2). Mechanisms in mammalian renal physiology presented with particular emphasis on recent techniques and concepts. Prerequisites: 305, Veterinary Anatomy Physiology 220 and 221 or equivalent.

450—Research (cr. arr.). Opportunities for research in physiology not leading to dissertation.

490—Research (cr. arr.). Research in physiology, leading to dissertation.

Physiology Area Program

The physiology area graduate program resides with 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 (314)882-2643

FACULTY

Steven G. Pueppke, chairman, professor, PhD, Cornell University
Arthur L. Karr Jr., director of graduate studies, associate professor, PhD, University of Colorado
Merton F. Brown Jr., professor, PhD, University of Iowa
Oscar H. Calvert, professor emeritus, PhD, University of Wisconsin
Arun K. Chatterjee, professor, PhD, University of Guelph
Victor H. Dropkin, professor emeritus, PhD, University of Chicago
Robert N. Goodman, professor, PhD, University of Missouri-Columbia
Daniel F. Millikan, professor emeritus, PhD, University of Missouri-Columbia
Anton Novacky, professor, PhD, Czechoslovak Academy of Sciences
Einar W. Palm, professor, PhD, North Dakota State University
Om P. Sehgal, professor, PhD, University of Wisconsin
Jack R. Wallin, professor emeritus, PhD, Iowa State University

Thomas D. Wyllie, professor, PhD, University of Minnesota
J. A. Wrather, associate professor, PhD, University of Missouri- Columbia
James T. English, assistant professor, PhD, University of Florida
Jeanne D. Mihail, assistant professor, PhD, University of Arizona
Terry L. Niblack, assistant professor, PhD, University of Georgia
James Schoelz, assistant professor, PhD, University of Kentucky

DEGREE: MS in plant pathology

INTERDISCIPLINARY AREA PROGRAM: PhD in genetics area program and PhD in pathology area program

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.

Stipends are available from the Agricultural Experiment Station, USDA-SEA and industry funds.

For information and application forms, write the Director of Graduate Studies, Department of Plant Pathology, Waters Hall, Columbia, Mo. 65211.

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.

MASTER'S DEGREE: To be accepted for advisement to the MS and 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. 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 MS degree.

COURSES

205—Forest Pathology (3) (same as Natul Resources 205). Provides basic understanding of biotic and abiotic agents that cause forest diseases and current approaches to disease control. Prerequisite: minimum of five hours of biology or equivalent.

305—Theory and Concepts of Plant Pathology (3) (same as Natural Resources 305 and Entomology 305). To provide information on disease development in plant populations; possible control strategies combined with training in retrieving and critically reviewing research information. Prerequisites: five hours of biology, junior, senior or graduate standing.

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. Pre-

requisite: 305 or concurrently.

307—Mycology (4) (same as Biological Sciences 307). A comprehensive survey of the fungi from a morphological and systematic approach. Prerequisites: Biological Science 202, six hours of biology, or instructor's consent.

310—Nematology (3) (same as Entomology 310). Biology, pathology, economic importance and control of plant diseases caused by nematodes. Prerequisite: one year of biology.

320—Intermediate Plant Pathology Techniques (3). Laboratory experiences designed to familiarize the student with organisms that cause disease and the responses of plants to such organisms. Prerequisites: 305 and 306.

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.

360—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.

361—Insects in Relation to Plant Diseases (3) (same as Entomology 361). Principles of insect transmission an dissemination of plant pathogens. Lectures, laboratory, greenhouse. Prerequisites: 305 and Entomology 101 or 201 or instructor's consent.

400—Problems (cr. arr.). Advanced individual studies; minor research problems. Prerequisite: graduate standing.

401—Topics (cr. arr.). 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.

405—Plant Virology (2). Principles of plant virus biology, structure and pathogenesis. Prerequisites: Plant Pathology 305 or equivalent and three hours of microbiology or equivalent.

406—Plant Bacteriology (2). Detailed study of diseases caused by bacteria; infection processes, establishment of host pathogen complexes (compatibility vs. incompatibility), defense mechanisms against bacteria; types of bacterial diseases. Prerequisites: 305 or equivalent and three hours microbiology or equivalent.

409—Fungal Plant Pathogens (3). Detailed study of fungi that cause plant disease; their classification, morphology, life and disease cycles and control measures. Prerequisites Biological Science 307 and instructor's consent.

410—Seminar (1). Presentation, discussion of extension studies, literature.

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: 305, 320, Biochemistry 270 and Biological Science 313.

412—Advanced Research Experimentation (4). In-depth laboratory experience designed to familiarize the student with contemporary research techniques in plant pathology. Prerequisites: 305, 306, 320 and instructor's consent.

416—Transport and Metabolism of Plant Nutrients (3) (same as Agronomy 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 or pathogens. Prerequisites: Biological Sciences 313 or Agronomy 315, Biochemistry 270 and 272.

423—Plant Disease Epidemiology (3). Introduction to the ecological concepts and quantitative tools necessary to examine plant disease epidemics as dynamic systems. Prerequisites: Plant Pathology 305, 306, 307.

426—Fungal Physiology (3). The physiology and biochemistry of fungi with particular emphasis on phytopathogenic fungi, biotechnologically important fungi and mycotoxin-producing fungi. Prerequisites: 305, 307 and Biochemistry 270.

435—Genetics of Plant-Microorganism Interaction (3). Molecular and general genetics of the interactions between plants and pathogenic or symbiotic microorganisms. Prerequisites: 305 and 306, one course each in biochemistry and genetics.

450—Research (cr. arr.). Research not expected to terminate in dissertation.

452—Transmission Electron Microscopy (3) (same as Veterinary Pathology 452). Provides extensive exposure to principles of TEM, instrumentation and techniques employed in biological research. Prerequisites: graduate standing and instructor's consent.

453—Scanning Electron Microscopy (3) (same as Veterinary Pathology 453). Provides basic principles and extensive exposure to instrumentation and procedure for scanning microscopy of biological materials. Prerequisites: graduate standing and instructor's consent.

490—Research (cr. arr.). Independent investigation in field of plant pathology to be presented as a thesis.

Political Science

College of Arts and Science
113 Professional Building (314)882-2062

FACULTY

Dean Yarwood, chairman, professor, PhD, University of Illinois

Arthur L. Kalleberg, director of graduate studies, professor, PhD, University of Minnesota

Ronald Bunn, professor, PhD, Duke University

Richard R. Dohm, professor, PhD, University of Minnesota

David A. Leuthold, professor, PhD, University of California-Berkeley

C. Peter Magrath, professor, University of Missouri System President, PhD, Cornell University

KC Morrison, professor, PhD, University of Wisconsin

Robin A. Remington, professor, PhD, University of Indiana

Paul Wallace, professor, PhD, University of California-Berkeley

David M. Wood, professor, PhD, University of Illinois

Thad Brown, associate professor, PhD, University of Michigan

Gregory Casey, associate professor, PhD, Georgetown University

Jeffrey Chinn, associate professor, Vice Provost, PhD, University of Wisconsin

Richard J. Hardy, associate professor, PhD, University of Iowa

N. Patrick Peritore, associate professor, PhD, University of California-Santa Barbara

Marvin L. Rogers, associate professor, PhD, University of California-Berkeley

Herbert K. Tillema, associate professor, PhD, Harvard University

David Webber, associate professor, PhD, University of Indiana

Marina Arbetman, assistant professor, PhD, Vanderbilt University

Karen McCurdy, assistant professor, PhD, University of Wisconsin-Madison

Birol Yesilada, assistant professor, PhD, University of Michigan

DEGREES: MA and PhD in political science

Alumni with PhD's have received teaching appointments at public and private colleges as well as positions of responsibility in state and national government and in many foreign countries. In recent years, an average of five students a year entered the PhD job market and all who have completed their degree have found positions. 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 several of its faculty have received awards and prizes for teaching excellence. It also strives to develop research skills and active scholarship in its students. Departmental alumni have written more than 30 books.

The department aims to train people as experts in 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.

Through the department's membership in the Inter-University Consortium of Political and Social Research, political science graduate students are eligible for summer training in quantitative analysis and research design at the University of Michigan. Courses in public opinion, policy analysis and decision making provide students with experience in research design, data analysis and computer applications.

Field experience in survey work is possible under auspices of the department's survey research laboratory, which conducts state and local surveys. Membership in the American Institute of Indian Studies assists advanced language training and field research in India and complements MU's South Asia Language and Area Studies program. Other international opportunities are available through University membership in the Universities Field Staff International.

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 24 departmental assistantships offer stipends up to $6,440 and complete remission of tuition.

To apply for research and teaching assistantships and fellowships or for additional information on the department's graduate program, write to the Director of Graduate Studies, Department of 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 six 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 to the department's director of graduate studies at the time of applying for admission. Those finding it impossible to comply with this requirement must take the GRE as soon after applying as possible, but no later than during the first semester in residence at MU. These are minimal requirements, they do not by themselves guarantee either admission or financial support, which depend upon competitive scores.

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 nine 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 generalist 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 non-thesis master's program to the PhD program must take 24 hours of course work and write a master's paper (for which six hours of credit is given). 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.

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 in the PhD program is determined by a 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 offer PhD programs that include at least 46 hours of graduate work, exclusive of dissertation research. At the option of the student's doctoral program committee, up to 30 hours of the MA program may be included in the PhD program. Such a program shall include at least 27 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 six hours in a tertiary field

In addition to the above seminar credits in political science, the following are required:

- a minimum of 13 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.

Total: 46 credits.

The PhD usually requires four years full time or the equivalent in part-time work beyond the bachelor's degree and three years beyond the MA. The difference between the minimum 46 semester hours the department requires and the 72 hours (beyond the bachelor's degree) required by the Graduate School is normally composed of courses devoted to preparation for comprehensive examinations (480) and dissertation research (490).

In addition to completing the necessary course work, the candidate must demonstrate the capacity to use a research tool (such as a foreign language or statistics), must 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.

210—Current Issues in American Politics (3). Investigation primarily through reading and discussion of contemporary issues in American politics. Content varies. Prerequisite: 1 or 11.

290—Proseminar in Political Science (1-3). For political science honors students. Introduction to honors studies in political science. Repeatable. S/U graded only.

298—Honors (1-6). Special readings, reports in the several fields of political science. For political science honors students.

300—Special Problems (cr. arr.). 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. Repeatable with departmental consent. Prerequisites: junior standing and instructor's consent.

302—Computing Methods (1). Develops computer-based skills with political science data. SAS, SPSSX and other packages used in mainframe and PC environments. S/U graded only. Prerequisite: concurrent enrollment in 326.

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: 1, 11 or 55, Economics 51 or equivalent.

305—Political Parties (3). Development, organization, functions, activities of major and minor political parties, pressure groups; election administration, especially in the United States. Prerequisites: junior standing and 1 or 11.

306—Municipal Government (3). Study of government of cities; political organization and urban problems. Prerequisites: 1 or 11, junior standing.

307—Political Campaigns and Voter Behavior (3). The role of elections in a democracy, the bases on which voters make decisions and the principles and procedures of managing campaigns, including the gathering and use of money, workers and other resources. Prerequisite: 1 or equivalent.

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.

311—Administrative Regulation of Business (3). Role of administrative agencies in development of regulatory policy in the United States.

314—American Foreign Policies (3). Bases, formulation, evaluation of current American foreign policies. Prerequisite: upper-level standing.

316—Congress and Legislative Policy (3). Study of national and state legislative systems and legislative policy making, with emphasis on Congress. Prerequisite: 1 or 11.

317—Public Policy (3). Introduction to the study of public policy in the United States. Analyzes public policy choices of national, state and local levels and the variety of forces which serve to shape policy decisions.

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: junior standing, 1 or 11.

321—The Constitution and Civil Rights (3). Civil rights in American constitutional context emphasizing freedom of religion, freedom of expression, minority discrimination, loyalty, rights of defendants. Prerequisites: junior standing, 1 or 11.

322—The United States Supreme Court (3). Role of Supreme Court in American system of government; particular attention given to reading biographies and writings of the Justices. Prerequisite: 320.

323—Law and the Political Process (3). Political uses of courts and legal bureaucracies; development of legal issues, recruitment, internal dynamics, decision making, policy outcomes and public opinion.

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—Politics of Pressure Groups (3). Internal politics of special interest groups — business, labor and agriculture,; techniques of influencing public policy in American political system. Prerequisite: junior standing, 1 or 11.

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 include nonparametric measures, probability and rudimentary hypothesis testing; computer applications with political data using SAS. Prerequisites: Mathematics 10 or equivalent, course in elementary statistics (Statistics 31), and concurrent enrollment in 302.

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: junior standing, 1 or 11.

330—Government Budgeting (3). Role of the budget in resource allocation, operations control and intergovernmental relations. Emphasis on the politics of budgeting, the planning-programming-budgeting system (PPBS) and financial problems of urban governments. Prerequisite: 310 or equivalent.

332—Administrative Agency Internship (3-6). Work experience with government agency at local, state, or national level. S/U grade only. Prerequisites: junior standing, 102 or 306.

333—Legislative Internship (3-6). Weekly work experience with an assigned individual legislator in Jefferson City, Mo. during regular session of state legislature, coordinated by faculty member. S/U grade only. Prerequisites: junior standing, 102 or 316.

334—Campaign Internship (3-6). Participation in political campaigns with coordination by faculty member. S/U grade only. Prerequisites: 307 previously or simultaneously, junior standing.

335—Lobbying Internship (3-6). Weekly work experience with an assigned lobbyist or lobbying group in Jefferson City, Mo. during regular session of state legislature, coordinated by faculty member. S/U grade only. Prerequisites: junior standing, 325.

336—Special Internship (3-6). Competitive paid internships in Jefferson City with interns selected by political science department. Coordinated by faculty members. S/U grade only. Prerequisite: junior 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: junior standing, 1 or 11.

350—Special Readings (cr. arr.). 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: junior standing, 1 or 11.

352—The Modern Welfare State (3). Focuses on the evolution of the modern welfare state in advanced, industrial, Western societies. Designed to give students an understanding of the major policy actions. Prerequisite: junior standing or instructor's consent.

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 Europe's 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—Comparative Communist Systems (3). Dynamics of communist revolutions; methods of consolidation, development-mobilization techniques, domestic problems, attempted solutions. Emphasis predominantly on Soviet and Eastern European states with some reference to Asian communist states and Cuba. Prerequisite: junior standing.

358—Soviet Foreign Policy (3). Principles, problems and evolution of Soviet foreign policy toward Western powers, developing nations and other Communist countries/parties. Prerequisite: junior standing.

360—American Political Thought (3). Development of political thought in America from colonial period to World War II. Prerequisite: junior standing.

361—Recent Democratic Theory (3). Analysis of political ideas of advanced industrial societies with emphasis on post-war United States. Considers problems of participation and representation, legitimacy and sovereignty, elitism and pluralism, liberty and equality, dissent, revolution and industrial democracy. Prerequisite: junior standing or instructor's consent.

362—Classical Political Thought (3). Origin and development of political theory; nature of justice; ethics and politics; political regimes and types of leadership; political revolutionary change; stoic and Christian natural law concepts. Prerequisite: junior standing or instructor's consent.

363—Modern Political Thought (3). Political theory of modern state; political realism in Machiavelli and Hobbes; social contract in Locke, Rousseau; natural right and utilitarianism in Bentham and Mill as basis for liberal state. Prerequisite: junior standing or instructor's consent.

364—Contemporary Political Theory (3). Development of political ideas from the late 19th century to present. Major thinkers considered Nietzsche, Dewey, Lenin, Mao, Fromm, Sartre, Niebuhr, Spengler, Gentile. 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 the Middle East.

371—Third World Politics (3). 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. Prerequisite: junior standing or instructor's consent.

372—International Relations in Asia (3). Survey of recent problems in relations among Asian nations and of U.S. policy in the region. Prerequisite: junior standing.

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.

376—Contemporary Chinese Politics (3). Comparative study of the evolution of national governments and policies in China and Taiwan.

385—International Organization (3). Forms, functions of international organizations; special reference to United Nations and International Court of Justice. Prerequisite: junior standing, 1 or 11.

400—Problems (cr. arr.). For graduate students with necessary prerequisite courses. Topics in one of the fields of political science for individual study.

401—Topics(cr. arr.). 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 Political Parties (3). Critical examination of literature in American party system.

406—Research in American Politics and Legislation (3). Directed research into one or more specific aspects of American party system, pressure groups, presidency, legislation, public opinion and the like.

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—Studies in Public Administration (3). Directed research involving selected topics in public bureaucracies.

418—Federalism and Intergovernmental Relations (3). Analyzes relationships among American governmental units emphasizing national-state relations and metropolitan area problems. Prerequisite: instructor's consent.

419—Logic of Political Inquiry (3). Examines assumptions underlying empirical social science and and theoretical issues in the study of politics. Primarily for second-year doctoral candidates in political science. 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.

422—Research Design and Analysis II (3). Analytic strategies and statistical models applicable to social science data. Emphasis is on modeling political phenomena. Prerequisite: 441 (or equivalent) or instructor's consent.

423—Seminar 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.

425—Seminar in Constitutional Law (3). Reading and critical examination of significant writings in American constitutional and legal theory.

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.

434—The Individual and the Work Group (3). Analyzes the work group as an arena of political participation and mobilization. Cross-national comparison of contemporary models of worker control and self-management.

440—Research Design and Analysis I (3). Research design, social measurement and statistical analysis for study of political phenomena. Prerequisite: 419 or 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. Prerequisites: 441 and Statistics 385 or equivalent with instructor's consent.

450—Research (cr. arr.). Independent research not leading to thesis.

452—Public Policies in Advanced 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 the United States, Japan and 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 Latin America.

460—Classical Political Thought (3). Readings in the classics of politics, ancient and medieval. Original works of Plato, Aristotle and others, read in full and analyzed; emphasis on critical evaluation of reports.

461—Modern Political Thought (3). Readings in the classics of early modern and modern political thought. Original works of Machiavelli, Hobbes, Locke and Rousseau read in full and analyzed; emphasis on critical evaluation of reports.

462—Contemporary Political Thought (3). Readings in major works of 20th-century political thought. Original works read in full and analyzed; emphasis on critical evaluation of reports.

463—Studies in Political Thought (3). Intensive analysis of selected political philosophers. Recommended for students with a special interest in political theory. Prerequisites: 262, 263, 460, 461 or instructor's consent.

465—Normative Political Theory Research (3). Intensive analysis of basic concepts of political theories; political system, justice, obligation, liberty, authority, responsibility, equality and community. Systematic political argument problems selected vary from term to term. Prerequisite: instructor's consent.

480—Independent Readings for PhD Comprehensive Examinations (16).

490—Research (cr. arr.). Independent research leading to thesis.

Practical Arts and Vocational-Technical Education

College of Education
323 Townsend Hall (314)882-8391

FACULTY

Richard C. Erickson, chairman, professor, PhD, Purdue University

Robert J. Birkenholz, director of graduate studies, associate professor, PhD, Iowa State University

Michael Dyrenfurth, professor, PhD, Bowling Green State University

John E. Elias, professor, EdD, University of Nebraska

W. R. Miller, professor, EdD, University of Missouri-Columbia

Donald D. Osburn, professor, PhD, University of North Carolina

Clifton Smith, professor, PhD, Virginia Polytechnic Institute

Jo Behymer, associate professor, EdD, University of Missouri- Columbia

Lonnie Echternacht, associate professor, EdD, University of Missouri-Columbia

Richard Linhardt, associate professor, PhD, University

of Missouri-Columbia

Lynda L. West, associate professor, PhD, University of Missouri- Columbia

Nan Erickson, assistant professor, PhD, University of Missouri-Columbia

Joan Quilling, assistant professor, PhD, Michigan State University

Sheila Ruhland, assistant professor, PhD, University of Wisconsin-Madison

Leon Schumacher, assistant professor, PhD, Iowa State University

DEGREES: MEd in practical arts and vocational-technical education, with emphasis areas in agricultural education, business and office education, marketing education, home economic education, industrial education or vocational education; and EdSp, EdD or PhD in practical arts and vocational-technical education, with emphasis areas in agricultural education, business and office education, marketing education, home economics education, industrial education, technology teaching or vocational education

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 education. Majors in the Department of Practical Arts and Vocational-Technical Education can elect an area of concentration in administration, curriculum development and research or vocational education for special needs students. Concentration areas in disciplines outside of professional education, such as economics, management and sociology also may be chosen.

See **Education** in this section for general information.

Additional information may be obtained from the Director of Graduate Studies, Department of Practical Arts and Vocational-Technical Education, 323 Townsend Hall, Columbia, Mo. 65211

COURSES

GENERAL

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.

F285—Implemeting a Vocational Instructional Management System (2). The study of the Missouri Voactional Instructional Management System and the knowledge and skills necessary to implement the system. System components; assessment of cognitive, psychomotor and affective vocational competencies; related instructional management software.

F300—Problems (cr. arr.). 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.

F308—Coordination of Cooperative Occupational Education (1-4). 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.

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 conferences. May repeat up to four semester hours.

F365—Occupational Analysis (2). Techniques, procedures of analyzing occupations into their basic elements. Required of trade teachers, coordinators.

F371—Vocational Education for Handicapped Students (3) (same as Special Education L371).

F372—Methods in Vocational Education for Handicapped Students (3). Emphasis on special/vocational education instructional techniques, curriculum modifications, classroom management strategies and vocational evaluation services.

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.

F400—Problems (cr. arr.).

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.

F410—Seminar in Practical Arts and Vocational-Technical Education (0.5-2).

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.

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. Prerequisite: curriculum course 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. Prerequisite: 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.

F490—Research (cr. arr.).

AGRICULTURAL EDUCATION

F264—Field Experience (1-2). The second level of field experience within one of the PAVTE program areas 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 Agricultural Education (10). Student teaching in the secondary schools.

F300—Problems (cr. arr.). Studies professional programs and issues or technical problems related to the field of practical arts and vocational-technical education.

F303—The Teaching of Agriculture (3). Developing instructional units, supervising individual occupational experience programs and guidance of student organizations. Prerequisite: Educational and Counseling Psychology A205 or instructor's consent.

F304—Programs for Out-of-School Groups in Agriculture (2). Programs in agriculture for out-of-school groups; particular emphasis on adult classes in agriculture. Prerequisite: F100 or instructor's consent.

F305—Programs and Instructional Materials in Agriculture (2). Plans programs, prepares teaching materials and evaluates programs in agriculture in public schools. Prerequisite: F100 or instructor's consent.

F306—Teaching Agricultural Mechanics (3). Organizing course content; conduct and management of an agricultural mechanics shop. Prerequisite: F100 or instructor's consent.

F307—Teaching of Agricultural Management (2). Organizing course content, developing instructional materials and preparing to teach agricultural management in high school and adult programs of agriculture. Prerequisites: Agricultural Economics 260, 312, F100 or instructor's consent.

F310—Agriculture in the Community Schools (2-4). Organization of instructional program and of instruction in agriculture in the community school. Prerequisites: baccalaureate degree and instructor's consent.

F400—Problems (cr. arr.).

F408—Seminar in Agricultural Education (1-3).

F420—Advanced Methods of Teaching Agricultural Mechanics (2-4). Determines needs, plans and administers programs, evaluates outcomes. Prerequisite: F306 or instructor's consent.

F440—Planning Programs of Supervised Experience in Ag Occupations (2-4). Surveys agricultural situations. Develops activities which lead to establishment. Evaluates programs with different groups. Prerequisite: 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. Prerequisite: 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. Prerequisite: baccalaureate degree in agriculture or instructor's consent.

F470—In-Service Course in Agricultural Education (cr. arr.).

F490—Research (cr. arr.).

BUSINESS EDUCATION

F251—Teaching Basic Business Subjects (2). Methods, techniques and measurement of achievement in teaching basic business subjects. Prerequisite: Educational and Counseling Psychology A205.

F252—Teaching Business Skills Subjects (2). Instructional objectives, materials, media, methodologies and measurement of achievement. Prerequisite: Educational and Counseling Psychology A205.

F264—Field Experience (1-2). The second level of field experience within one of the PAVTE program areas at the secondary or post- secondary level. Student participates 30 clock hours for each semester hour of credit. Prerequisite: completion of F164. S/U graded only.

F299—Student Teaching in Business Education (10). Student teaching in the secondary schools.

F300—Problems (cr. arr.). Studies professional programs and issues or technical problems related to the field of practical arts and vocational education.

F301—Seminar (1-3). Prerequisite: instructor's consent.

F325—Field Study in Occupational Education (1-4). Directed observation in a cross section of business and industry combined with reports, weekly seminars and conferences. May repeat until four semester hours have 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: Educational Research and Statistics R314 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 communica-

tions. Prerequisite: Educational Research and Statistics R314 or equivalent.
F360—Topics (cr. arr.).
F400—Problems (cr. arr.).
F409—Principles of Business Education (3). Organization, curriculum, problems and trends of business education in secondary schools and colleges.
F414—Seminar in Business Education (1-3).
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.
F422—Improvement of Instruction in Business Skills Subjects (3). Developments and trends in the instructional program of business skills courses.
F490—Research (cr. arr.).

HOME ECONOMICS EDUCATION

F235—Organization of Vocational Home Economics (2). Organizing and administering curriculum and instruction for consumer homemaking and occupational home economics programs.
F264—Field Experience (1-2). The second level of field experience within one of the PAVTE program areas at the secondary or post- secondary level. Student participates 30 clock hours for each semester hour of credit. Prerequisite: F164. S/U graded only.
F275—Occupational Home Economics Programs (2). Problems, methods, procedures in planning and conducting occupational home economics programs. For prospective elementary and secondary teachers. Prerequisites: F235 and Educational and Counseling Psychology A205.
F280—Methods of Teaching Vocational Consumer Homemaking (3). Methods of teaching vocational consumer-homemaking programs, kindergarten-adult. Prerequisites: F235 and Educational and Counseling Psychology A205.
F299—Student Teaching in Home Economics Education (10). Student teaching in the secondary schools.
F300—Problems (cr. arr.). Studies professional programs and issues or technical problems related to the field of practical arts and vocational education.
F315—Current Developments in Home Economics Education (3). Analysis of current concerns which affect home economics programs. Prerequisites: F235 and Educational and Counseling Psychology A205.
F376—Homemaking Education for Adults (2-3). Problems in organization, presentation of programs in homemaking education for adults, homemaking and gainful employment. Includes laboratory experiences. Prerequisite: F280 or instructor's consent.
F400—Problems (cr. arr.).
F413—Seminar in Home Economics Education (1-3).
F430—Supervision of Student Teaching of Vocational Home Economics (2-3). For those preparing to become supervisors in vocational home economics education. Prerequisites: F280 and Curriculum and Instruction F299.
F446—Curriculum Construction in Home Economics (2-3). For home economics teachers engaged in curriculum development or revision. Individual research study and development of curriculum materials.
F472—In-Service Course in Home Economics Education (cr. arr.). Individual and group study of problems related to teaching, supervision and administration of home economics education at secondary and post-secondary levels.
F482—Review and Synthesis of Research in Home Economics Education (3). Review and analysis of historical and current developments in home economics and home economics education research with implications for classroom teachers.
F490—Research (cr. arr.).

INDUSTRIAL EDUCATION

F221—Machine Woodworking (2-3). Operation of woodworking machines, mass production methods, lumbering, cabinetmaking, upholstery and finishing. Prerequisite: F10.
F254—Power Technology (3). An intermediate treatment of internal and external combustion engines; power transmission; automotive systems; testing, instrumentation and control; maintenance and repair of power systems. Lecture plus laboratory. Prerequisite: F154.
F256—Alternate Energy Technology (3). An intermediate treatment of active and passive solar heating and cooling; wind energy; hydro-electric energy; biomass; alcohol and synthetic fuels. Lecture plus laboratory. Prerequisite: F154.
F264—Field Experience (1-2). The second level of field experience within one of the PAVTE program areas at the secondary or post- secondary level. Student participates 30 clock hours for each semester hour of credit. Prerequisite: F164. S/U graded only.
F299—Student Teaching in Industrial Education (10). Student teaching in the secondary schools.
F300—Problems (cr. arr.). Studies professional programs and issues or technical problems related to the field of practical arts and vocational education.
F301—Seminar (1-3). Prerequisite instructor's consent.
F325—Field Study in Occupational Education (1-4). Directed observation in a cross section of business and industry combined with reports, weekly seminars and conferences. May repeat until four semester hours accumulated.
F331—Technology of Woodworking (2-3). Design and construction of advanced-level products of wood; study of technological developments relating to wood products, processes and related materials; laminating and bending; mass producing with jigs; experiments in woodworking. Prerequisite: F221.
F341—Metals Processing Technology (2-3). Principles of manufacturing cost, design and analysis, dimensional quality control, theory and technology of metal cutting, welding and foundry processes. Prerequisite: F112.
F350—Industrial Design (3). Principles of structural design, contour, surface enrichment applied to three-dimensional objects; sketches, details, working drawings of shop projects.
F355—Applied Electronics (3). Transistor and vacuum tube characteristics and circuits; amplifiers; am and fm receivers and transmitters; introduction to digital theory; electronic circuit construction. Lecture plus laboratory. Prerequisite: F155.
F361—Architectural Drawing and Home Design (3). Problems, procedures in planning and constructing a home. Students draw and write specifications for complete set of house plans. Prerequisite: F350.
F375—Selection and Organization of Subject Matter (3). Objectives, content selection and arrangements, preparation of job and informational assignments, course making. For shop teachers, coordinators.
F385—Manufacturing Processes (2-3). Processes involved in manufacture of ferrous and nonferrous metal products, textiles, wood products, including paper, plastics and other synthetics, rubber, glass and chinaware, leather, lubricants, fuel, cement and clay products. Prerequisite: nine hours in technical subjects.
F390—Principles of Teaching Industrial Subjects (2-3). Shop teacher's job; learning in the school shop; discipline and shop management; teaching devices and procedures; measurements of achievement; interschool, community relations.
F400—Problems (cr. arr.).
F412—Seminar in Industrial Education (1-3).
F471—In-Service Course in Industrial Education (cr.arr.).
F490—Research (cr. arr.).

MARKETING EDUCATION

F225—Human Relations in Organizations (3). Principles, theory, processes and problems of effective human relations in marketing organizations.
F264—Field Experience (1-2). The second level of field experience within one of the PAVTE program areas at the secondary or post- secondary level. Student participates 30 clock hours for each semester hour of credit. Prerequisite: F164. S/U graded only.
F299—Student Teaching in Marketing Education (10). Student teaching in the secondary schools.
F300—Problems (cr. arr.). Studies 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 Internships & Community Based Experiences (3). Study of methods and techniques for organization, management and supervision of student placements in marketing internships and community based learning experiences.
F325—Field Study in Occupational Education (1-4). Directed observation in cross section of business and industry combined with reports, weekly-seminars and conferences. May repeat until four semester hours accumulated.
F397—Curriculum Construction in Marketing Education (4). Derivation of objectives, selection and arrangement of instruction units and materials for marketing education. Construction and use of evaluative devices.
F398—Principles of Teaching Marketing Education (5). Methods, techniques, media and measurement of achievement in teaching marketing.
F400—Problems (cr. arr.).
F475—In-Service Course in Marketing Education (cr. arr.).
F490—Research (cr. arr.).

Psychological Statistics and Methods

College of Arts and Science
16 McAlester Hall (314)882-3360

FACULTY

Harris M. Cooper, coordinator, professor of psychology, PhD, University of Conneticut
Asit P. Basu, professor of statistics, PhD, University of Minnesota
John E. Hewett, professor of statistics, Phd, University of Iowa
Paul L. Speckman, associate professor of statistics, PhD, University of California-Los Angeles
Peter Frensch, assistant professor of psychology, PhD, Yale University
Phillip Wood, assistant professor of psychology, PhD, University of Minnesota

The minor, offered through the cooperation of the Department of Psychology and the Department of 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.

PHD 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, will also 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 the 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 the coordinator in 16 McAlester Hall, Columbia, Mo. 65211, or call (314)882-3360.

Psychology

College of Arts and Science
210 McAlester Hall (314)882-6860

FACULTY

Thomas M. DiLorenzo, chairman, associate professor, PhD, West Virginia University
Craig A. Anderson, director of graduate studies, associate professor, PhD, Stanford University
Wayne P. Anderson, professor, PhD, University of Missouri-Columbia
Douglas G. Anger, professor emeritus, PhD, Harvard University
Bruce J. Biddle, professor, PhD, University of Michigan
June E. Chance, professor emeritus, PhD, The Ohio State University
Harris M. Cooper, professor, PhD, University of Connecticut
Robert S. Daniel, professor emeritus, PhD, Indiana University
Robert H. Dolliver, professor, PhD, The Ohio State University
Russell G. Geen, professor, PhD, University of Wisconsin
Alvin G. Goldstein, professor emeritus, PhD, Clark University
P. Paul Heppner, professor, PhD, University of Nebraska
Theodore F. Henrichs, professor, PhD, University of North Carolina-Chapel Hill
Donald H. Kausler, professor, PhD, Washington University
Joseph LoPiccolo, professor, PhD, Yale University
David G. McDonald, professor, PhD, Washington University
John H. Mueller, professor, PhD, St. Louis University
Lizette Peterson-Homer, professor, PhD, University of Utah
Mark H. Thelen, professor, PhD, Michigan State University
Joseph S. Thorpe, professor, PhD, University of Texas
Glenn Hausfater, adjunct professor, PhD, University of Chicago
Javad H. Kashani, adjunct professor, MD, Meshed University
Charles M. Borduin, associate professor, PhD, Memphis State University
Nelson Cowan, associate professor, PhD, University of Wisconsin
Kenneth J. Sher, associate professor, PhD, Indiana University
Dennis Wright, associate professor, PhD, University of California-Berkeley
Neils C. Beck, adjunct associate professor, PhD, St. Louis University
Nan Presser, adjunct associate professor, PhD, University of Texas
Robert G. Frank, adjunct associate professor, PhD, University of New Mexico
Frederick Vom Saal, adjunct associate professor, PhD, Rutgers University
Deborah Bell-Dolan, assistant professor PhD, West Virginia University
Peter French, assistant professor, PhD, Yale University
David Geary, assistant professor, PhD, University of California-Riverside
Glenn Good, assistant professor, PhD, The Ohio State University
Steven A. Hackley, assistant professor, PhD, University of Wisconsin
Douglas S. Krull, assistant professor, PhD, University of Texas-Austin
Laurie B. Mintz, assistant professor, PhD, The Ohio State University
Todd R. Schachtman, assistant professor, PhD, State University of New York-Binghamton
Timothy Trull, assistant professor, PhD, University of Kentucky
Cynthia Viera, assistant professor, PhD, Arizona State University
Philip Wood, assistant professor, PhD, University of Minnesota
Thomas J. Amolsch, adjunct assistant professor, PhD, University of Missouri-Columbia
Kathleen Anger, adjunct assistant professor, PhD, University of Missouri-Columbia
Susan P. Buckelew, adjunct assistant professor, PhD, Auburn University
Richard N. Gowdy, adjunct assistant professor, PhD, Oklahoma State University
Gerald H. Heisler, adjunct assistant professor, PhD, Southern Illinois University-Carbondale
Andrew Homer, adjunct assistant professor, PhD, University of Utah
Bruce Horwitz, adjunct assistant professor, PhD, University of Missouri-Columbia
Leslie Luchene, adjunct assistant professor, PhD, Washington University
Marc Maddox, adjunct assistant professor, PhD, University of Missouri-Columbia
Robert A. McGrath, adjunct assistant professor, PhD, University of Illinois-Urbana
Anthony Menditto, adjunct assistant professor, PhD, University of Houston
Cathryn Pridal, adjunct assistant professor, PhD, State University of New York-Stony Brook
Helen J. Roehlke, adjunct assistant professor, PhD, University of Missouri-Columbia
Brenda Weishaar, adjunct assistant professor, PhD, University of Wyoming
Ruth Wright, adjunct assistant professor, PhD, University of Missouri-Columbia

DEGREES: MA and PhD in psychology, with emphasis areas in clinical psychology, counseling psychology, general experimental psychology and social psychology; MS in psychology, with emphasis areas in counseling psychology and teaching of psychology

Experimental Psychology: A strong foundation in experimental methodology is of fundamental importance to all graduate training. The program is designed to give the student a thorough background in statistics, scientific methodology and content courses. A number of faculty research programs are supported by grants that provide stipends and training opportunities for students.

The PhD program in experimental psychology includes approximately 30 semester hours in research. The primary objective of the experimental program is to give the student a thorough substantive and methodological foundation in experimental psychology. The PhD program emphasizes student research and collaboration in faculty research in the areas of cognitive processes, human and animal learning, memory, gerontology, perception, physiological psychology and motivation.

In the Melvin H. Marx Psychology Animal Research Laboratory, the department maintains a variety of equipment for the study of animal learning, motivation, comparative behavior and physiological correlates of behavior. A fully equipped laboratory for the study of the electroencephalogram and muscle action potentials is available for use in McAlester Hall. McAlester Hall also has laboratories equipped for studies in human learning and memory, visual and auditory perception and experimental-social psychology.

Clinical Psychology: The clinical psychology program, approved by the American Psychological Association, is coordinated by a director and a committee made up of faculty members specializing in this area. The philosophy of training is to achieve a balance between scientific and service activities. The program prepares students for teaching, research and service in universities, clinics, hospitals and similar agencies. In addition to the research emphasis and training in basic areas of psychology (that characterize all of the programs in the department), clinical students obtain training in behavior theory and dynamics and in techniques of assessment and behavior change. Supervised experience is provided through practicum courses in the department's psychological clinic and, by arrangement through the department, paid clerkships in campus and other cooperating institutions such as Fulton State Hospital, Mid-Missouri Mental Health Center and the Health Sciences Center.

Counseling Psychology: The program in counseling psychology is accredited by the American Psychological Association and is offered in cooperation with the Department of Educational and Counseling Psychology. It is designed to train psychologists for work in universities, the Veterans Administration and public or private agencies. Program emphasis is on research and a strong basic foundation in general psychological behavior theory, followed by intensive training in supervised practicums and internships. Facilities for the latter part of the program are provided by local agencies such as the MU Counseling Service, state and federal agencies and the Veterans Administration.

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 of the specialized course work may begin in the first year, with concentrated seminars and other courses coming in the second and third years. Emphasis is given to social cognition, social motivation, personality theory, behavior dynamics, role theory and environmental psychology. Other aspects of this rapidly developing area include the social aspects of health and education. In addition to the general research training in the department, there are opportunities for research experience in the Center for Research in Social Behavior.

These programs and others are more fully

described in brochures available from the department chairman. 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 consent of the instructor.

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.

MASTER'S DEGREE, NON-THESIS OPTION: MS degree requirements are 40 hours, including three to six hours in 400 or 450 and a practicum. Also required is a special investigation (experimental or scholarly) submitted in written form to the student's committee which, subsequently, conducts an oral examination on the report.

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 (cr. arr.). Research apprenticeship with a faculty member, assisting a faculty member in the development and execution of research. May be repeated to six hours maximum. Prerequisite: instructor's consent.

201—Topics (cr. arr.) Organized study of selected topics in psychology. Particular topics and earnable credit may vary from semester to semester. Prerequisites: 1 or 2, sophmore standing, and instructor's consent.

205—Environmental Psychology (3). Survey of the effects of environmental variables (such as temperature, noise, crowding) on behavior. Some coverage of techniques for modifying behavior to preserve the environment. Prerequisite: 1 or 2.

211—Theories of Learning (3). Considers viewpoints in learning; emphasizes classical issues and theories; considers these in contemporary form. Prerequisite: five hours of psychology.

212—Human Learning (3). Factors affecting human learning, retention; basic principles of learning, forgetting. Prerequisite: 1 or 2.

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 or 2 and Statistics 31 or Statistics 31 concurrently.

216—Advanced Experimental Psychology (3). Individualized supervision in planning, conducting and communicating original research. Recommended for majors desiring opportunity to work in research areas of their interest. Prerequisites: 215 and instructor's consent.

230—Individual Differences (2). Surveys individual, group differences. Contributions of various factors to variations in behavior. Prerequisite: 2 or Statistics 31.

260—Social Psychology (3) (same as Sociology 260). Social bases of behavior and behavior of individuals in social situations. Prerequisite: 1 or 2 or Sociology 1.

270—Psychology of Personality (2). Introduction to study of human personality. Prerequisite: 1 or 2.

279—Human Memory (3). This is an undergraduate survey course introducing the information processing perspective on the topics of encoding, storage and retrieval of verbal and non-verbal information in human memory. Prerequisite: 215 or instructor's consent.

291—Honors Proseminar (3). Individual honors thesis on a topic selected with a faculty adviser. Students projects are carried out over the course of two semesters (294 in winter semester). Students should plan on enrollment in both 291 and 294. Weekly class discussions of research topics, strategies and current issues. Successful completion of thesis and maintenance of 3.3 GPA leads to degree with honors in psychology. Prerequisites: junior or senior standing, overall GPA and psychology GPA of 3.3, and instructor's consent.

294—Honors Proseminar (3). Prerequisite: 291.

300—Special Problems (cr. arr.). Independent investigation leading to a project or paper. Repeatable upon consent of department. Prerequisite: instructor's consent.

301—Topics (cr. arr.). 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 and instructor's consent.

302—Theories of Personality (3). A survey of human personality theories. Prerequisite: 1 or 2.

304—Industrial Psychology (3). Training, efficiency, supervision, morale, group dynamics, consumer research in business and industry. Prerequisite: Statistics 31.

308—Ethical Issues in Psychology (3). Issues and problems in research, service, and public policy: privacy, confidentiality, consent, deception, coercion, exploitation, value conflicts. Extensive writing required. Prerequisites: junior or senior standing and consent of instructor.

313—Physiological Psychology (3). Survey of findings in behavioral neuroscience including issues concerning sleep, learning, drugs, motivation, eating, reproduction and language.

316—Experimental Approaches to Personality (3). Surveys current research in personality, emphasizes experimental evidence from human and animal studies. Prerequisite: 215 or instructor's consent.

326—The Self and Social Interaction (3). This course examines the self, its antecedents and consequences, from a theoretical and experimental prospective. Prerequisite: psychology major and nine hours in psychology.

330—Animal Behavior (3). Comparative study of animal behavior. Relation of behavior to bodily structure, environment. Prerequisites: 1 or 2 plus eight hours of psychology or biological science.

340—Human Inference and Social Judgment (3). This seminar focuses on social and cognitive research on various judgments under uncertainty. Both person-centered judgments (attributions) and nonperson-centered judgments (covariation detection) are included. Prerequisites: 260 and 212 or graduate standing.

343—Advanced Social Psychology (3) (same as Sociology 343). Prerequisite: 260 or instructor's consent.

344—Group Dynamics and Role Theory (3) (same as Sociology 344). Detailed investigation of one or more theoretical and experimental areas in social psychology. Prerequisite: 260 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. Prerequisite: nine hours of psychology or graduate standing.

346—Structure of Interpersonal Behavior (3) (same as Sociology 346). Prerequisite: 260 or instructor's consent.

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 and 280 or equivalent.

350—Special Readings (cr. arr.). 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. Prerequisites: 1 or 2 and junior standing.

360—Systematic Psychology (3). Critical evaluation of major theoretical systems of psychology. Introduces methodological problems of theory construction, system making. Emphasizes integration of recent trends. Prerequisites: nine hours of psychology and junior standing.

361—The History of Psychology (3). Historical foundations of contemporary psychology. Prerequisites: senior standing and nine hours of psychology.

365—Introduction to Clinical Psychology (3). Role of clinical psychology in mental health rehabilitation and social welfare work. Prerequisite: senior psychology major or graduate standing in related fields.

366—Methods of Psychotherapy (3). Review of major theories and techniques of individual psychotherapy with adults. Ethical and professional issues and research related to psychotherapy are also discussed. Prerequisite: nine hours of psychology.

369—Advanced Physiological Psychology (3). In-depth study of selected topics in psychology. Prerequisite: 313 or instructor's consent.

371—Attitude Change (3) (same as Sociology 371). Methods, theories, experimental findings in social attitude research. Prerequisites: 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: Statistics 31.

379—Human Learning Laboratory (5). Rote learning, concept learning and organization, transfer and retention, with special reference to verbal behavior. Prerequisites: 215 and senior standing.

380—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: 215.

385—Experimental Social Psychology (3). Experimental studies of attitudes, social interaction, person perception and other topics of contemporary social psychology. Prerequisites: 215 and 260.

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 or 2 and 170 recommended.

390—Cognitive Neuroscience (3). The neural basis of

human information processing. Memory, attention, perception, imagery, movement, language, dreams. Prerequisites: 215, and six hours of psychology.

393—Perception (3). Data and contemporary theories of perception in all of the senses, with emphasis on visual and auditory perception. Prerequisite: six hours of psychology.

399—Motivation (3). Survey of historical and contemporary theory; research on motivation. Major emphasis on motivation from the perspective of learning theory. Topics drive theory, incentive motivation, anxiety, activation-arousal theory and stimulus sampling theory. Prerequisite: senior psychology major.

400—Problems (cr. arr.). Advanced studies to meet needs of individual student. Prerequisite: instructor's consent, departmental consent for repetition.

401—Topics (cr. arr.). Organized study of selected topics in psychology. Particular topic and earnable credit may vary from semester to semester. Prerequisite: 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." Prerequisite: graduate standing or instructor's consent.

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 and research in normal human development.

407—Developmental Psychopathology (3). Etiology, diagnosis and treatment of disordered behavior from infancy through adolescence. Emphasizes contrasting theories and research issues. Prerequisite: 347 or equivalent.

408—Behavior Disorders (3). Problems of etiology, diagnosis, treatment in psychopathology. Considers theory, research and case histories. Prerequisite: 345.

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 and mental retardation.

410—Field Practice and Orientation to Psychology (1). An orientation to graduate study in psychology, including field visits to psychology research units on and off campus. S/U graded only. Prerequisite: graduate standing.

411—Studies in Professional Problems (2-3). Sources for psychological literature research, techniques of scientific reporting, problems of professionalism.

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.

414—Orientations to Clinical Assessment (3). Topics include psychometric principles, intelligence testing, objective and projective personality testing and behavioral assessment. Prerequisites: graduate standing in psychology and 412.

416—Studies in Personality (cr. arr.). Contemporary research and theory in personality. Repeatable upon consent of department. Prerequisite: 280 or equivalent.

417—Objective Personality Appraisal (3). Construction, interpretation and use of such objective instruments as the Minnesota Multiphasic Personality Inventory, Edwards Personal Preference Schedule, Guilford-Zimmerman. Prerequisites: second-year graduate standing and an introductory testing course or equivalent.

418—Studies in Clinical Psychology (cr. arr.). 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, non-parametric statistics. Prerequisite: undergraduate course in statistics.

420—Advanced Psychological Statistics II (3). Complex analysis of variance; experimental design. Prerequisite: 419 or equivalent.

421—Advanced Techniques in Psychological Statistics (3). Multiple regression, covariance analysis, multivariate analysis of variance, factor analysis as applied to problems in psychology. Prerequisite: 420 or equivalent.

422—Studies in Learning (cr. arr.) Critical consideration of selected experimental work in psychology of learning and memory. Prerequisites: 378 or 379, departmental consent for repetition.

424—Studies in Physiological Psychology (cr. arr.). Critical consideration of recent experimental, theoretical work. Prerequisites: 313, departmental consent for repetition.

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: instructor's consent.

428—Studies in Psycholinguistics (3) (same as Linguistics 428). Selected topics in psycholinguistics; emphasizes language competence versus performance, effects of syntax on memory, developmental linguistics. Prerequisite: graduate standing in psychology or instructor's consent.

429—Advanced Theories of Learning (3). Intensive coverage of major theories of learning and evaluation of them in the context of the contemporary field of psychology.

430—Latent Variable Models in Statistical Analysis (3). Covers Matrix Algebra fundamentals, Factor Rotation, Communality Estimation techniques, Higher Order and Dynamic Factor Models, Path Analysis, Use of computer programs. Prerequisite: 420.

431—Latent Variable Models in Statistical Analysis (3). Covers matrix algebra fundamentals, factor rotation, communality estimation techniques, higher order and dynamic factor models, path analysis, use of computer programs. Prerequisite: 420.

432—Medical Orientation for Clinical Psychologists (2). Considers relationships between psychological and medical problems. Prerequisite: MA in psychology.

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. PhD candidates only. Required for all PhD candidates in social psychology program. Prerequisite: instructor's consent.

434—Seminar in Social Psychology II (3) (same as Sociology 434). Continuance of 433. Required of all PhD candidates in social psychology program. Prerequisite: 433 or instructor's consent.

435—Experimental Social Psychology (3). Advanced survey of current experimental research in social psychology, with emphasis on implications of research for emerging theories. Prerequisite: 434.

436—Psychobiology of Social Development (3). Survey of social development from infancy to adulthood. Prerequisite: 406 or 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 aberrations and sex crimes covered. Prerequisite: graduate standing.

442—Community Psychology (2). Lectures, discussion, readings and field observation to acquaint student with the philosophy, technique and theory of community mental health. Prerequisite: MA in psychology.

443—Studies in Social Psychology (cr. arr.). Critical coverage of selected research and theory in social psychology. Prerequisites: instructor's consent, departmental consent for repetition.

445—Clinical Practicum (cr. arr.). Intensive supervised training in use and interpretation of psychological techniques and in psychotherapy. S/U graded only. Prerequisites: 412, 414 and instructor's consent.

446—Clinical Child Assessment (3). Introduction to clinical instruments, techniques and problems in the psychological assessment of children. Prerequisite: 412.

447—Clinical Intervention with Children (3). Introduction to theory, research and practice in the area of behavior change with children and adolescents. Prerequisite: 446.

448—Counseling Practicum (cr. arr.). Supervised practice of counseling in approved counseling agency. S/U graded only. Prerequisites: 376, Educational and Counseling Psychology A371 and A420.

449—Structured Groups (3). Intended to train students to develop and run structured groups for (1) Life skills, anxiety management, effective parenting, (2) Life Theme, self-esteem, women's awareness, (3) Life Transition, divorce, personal loss. Prerequisite: instructor's consent.

450—Research (cr. arr.). Experimental investigations not leading to thesis.

451—Clinical Research Methods (3). Focus on research design, with emphasis on active critique of methodological challenges (subject selection, control groups, multimodal measures and treatment issues). Includes lecture and active review of research. Prerequisites: graduate standing and permission of instructor.

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.

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 consent.

462—Family and Group Process (3). Conceptual approaches to family and group interaction considered; contemporary research and treatment. Prerequisites: 425, graduate standing in psychology, or instructor's consent.

463—Animal Behavior Analysis and Principles of Behavior Modification (3). Basic principle of operant and Pavlovian learning, motivation, extinction, inhibition, avoidance and their application to human behavior and its modification. Prerequisite: graduate standing.

470—Social Interaction Research (3). Seminar on research methods in social interaction. Prerequisite: 343 or 405 or instructor's consent.

485—Social Psychology Methodology (3). Advanced study of experimental methods in social psychological research. Prerequisites: 343 and instructor's consent.

486—Applied Research Methodology (3). Advanced study of methods and methodological issues associated with psychological research conducted in field or non-experimental settings. Topics include measurement of change, structural modeling, time series and quantitative literature reviewing. Prerequisite: instructor's consent.

487—Methods and Findings in Counseling Process and Outcome Research (3). The course focuses on contemporary issues in the counseling psychology research literature and psychological writing. Prerequisites: 419, 448, or equivalents.

490—Research (cr. arr.). Investigations in psychology; leads to thesis.

494—Cognitive Psychology (3). Perception, thinking and language processes examined from the perspective of and information processing theory. Prerequisite: graduate standing or instructor's consent.

Psychology

Public Administration

College of Business and Public Administration
315 Middlebush (314)882-3304

FACULTY

Stanley B. Botner, chairman, professor, PhD, University of Missouri-Columbia
Brenda S. Gardner, director of graduate studies, assistant professor, PhD, University of Missouri-Columbia
Robert F. Karsch, professor emeritus, PhD, University of Missouri-Columbia
Robert W. Paterson, professor emeritus, PhD, University of Virginia
Guy B. Adams, associate professor, OPA, George Washington University
Michael A. Diamond, associate professor, PhD, University of Maryland
John Forrester, assistant professor, PhD, University of Georgia
Sheilah Watson, assistant professor, PhD, University of Oklahoma

DEGREES: MPA in public administration

COOPERATIVE DUAL DEGREE: MPA and MS in public health, with an emphasis area in health services management

The Department of Public Administration of 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 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), areas of specialization (nine hours) and an internship (six hours). After admission to the MPA program, students who have deficiencies in their undergraduate work may be required to take additional courses for no credit toward the degree.

A summer internship between the first and second years of study provides the students with work/training experience in the administration of a major policy or program. Internships may be arranged with local, state or federal governmental agencies and with other non-profit organizations of a public nature.

For further information write to the Director of Graduate Studies, Department of Public Administration, College of Business and Public Administration, 315 Middlebush Hall, Columbia, Mo. 65211.

COURSES

205—Managing the Public Sector (3). Survey of the management of organizations and programs in the public sector. Prerequisite: Management 202.

300—Problems (cr. arr.). Intensive study of an area of public administration related to the student's special interest.

354—Public Budgeting (3). The politics, economics and applied aspects of budgeting in the public sector. Examines the role of the budget in resource allocation, operations control and intergovermental relations.

371—Business, Society and Government (3). Addresses the social significance of business, the relationship of business to social change and societal values and conflicting interpretations of the role of business in American life and politics. Explains public policy processes and examines business-government relations in some detail.

400—Problems (cr. arr.). Intensive study of an area of public administration related to the student's special interest.

401—Career Development in Public Organizations (3). Examines the historical, political, organizational, ethical and interpersonal aspects of public administration with a view toward acquiring administrative knowledge and skills for one's career development in public organizations.

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. Prerequisite: three hours of statistics.

403—Topics (3). Select current topics in public administration. Prerequisite: instructor's consent.

407—Government Accounting for Non-Accountants (3). Introduces the basics of governmental accounting. Topics include basic accounting principles, governmental accounting practices, the fund accounting model and accounting for non-profit organizations.

451—Action Skills in Public Organizations (3). Focuses on understanding human action in administrative situations and on developing personal capacities for effective action in varied and difficult situations.

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. Prerequisite: three hours of statistics.

454—Public Budgeting and Taxation (3). Intensive study of the institutions, processes, politics, and social and economic impact of public taxation and expenditures. Prerequisite: macroeconomics.

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. Prerequisite: accountancy.

456—Program Review and Evaluation (3). Applies systematic, objective methods for evaluating effectiveness of public programs; means for determining extent to which program administration facilitates achievement of program objectives. To be taken during student's last semester in the program.

457—Public Personnel Administration (3). Basic functions, processes and problems of personnel administration in the public service.

459—Seminar in Public Financial Management (3). Capstone course where students are given an opportunity to address real world or simulated problems in their interest areas. Prerequisites: 454, 455, a public finance course and accountancy course.

460—Planning for Manpower Programs (3). Information requirements and sources of information for manpower planning. Examines the manpower planning process in terms of the interaction of manpower, education and welfare institutions. Prerequisite: Economics 312.

465—Organizational Change and Development in the Public Sector (3). Emphasizes the development of professional effectiveness and interpersonal competence. Stresses action skills approach to learning and extensive utilization of psychological instruments for self/other awareness, with strong emphasis on usefulness of socio-psychological knowledge, along with laboratory training and learning.

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. Prerequisite: 401.

471—Management and Organization of State Government (3). This course focuses on the management of human, fiscal and organizational resources in state government, including program planning, development, implementation, review and evaluation.

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.

Radiologic Sciences

School of Health Related Professions
313 Clark Hall (314)882-8045

COURSES

300—Problems in Nuclear Technology (1-3). Supervised investigation in an aspect of nuclear medicine technology, usually culminating in a written report.

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 Nuclear Engineering 327). Radionuclide imaging systems and the use of computers. Topics include Anger camera systems, emission tomography, ultrasound, nuclear magnetic resonance and bone absorptiometry. Prerequisites: Chemistry 361 or equivalent and instructor's consent.

329—Radiopharmaceuticals in Nuclear Medicine (2). Introduces concepts of radiopharmacy, generator systems, labeling of materials, quality control procedures and FDA regulations concerning radiopharmaceuticals. Prerequisites: Chemistry 361 or Radiology 227 and instructor's consent.

Radiology

School of Medicine
M201 Medical Sciences Building (314)882-8183

The School of Medicine does not offer a graduate degree in radiology, but some courses are available to graduate students.

COURSES

328—Introductory Radiation Biology (3) (same as Biological Sciences 328, Nuclear Engineering 328 and Veterinary Medicine and 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 and 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.

Radiopharmaceutical Chemistry

College of Arts and Science
123 Chemistry Building (314)882-8374

FACULTY

David E. Troutner, professor of chemistry, PhD, Washington University

Wynn A. Volkert, professor of radiology and biochemistry, associate career research scientist at Truman Veterans Hospital, PhD, University of Missouri-Columbia

Gary J. Ehrhardt, senior research scientist, Missouri University Research Reactor, adjunct research assistant professor of radiology, PhD, University of Missouri-Columbia

Alan R. Ketring, senior research scientist, Missouri University Research Reactor, adjunct research assistant professor of radiology, PhD, Washington University

J. Steven Morris, adjunct assistant professor of chemistry, PhD, University of Missouri-Columbia

The faculty have both formal training and wide experience in radiochemistry. Faculty from outside the Department of Chemistry will assist in the teaching program under terms mutually agreeable to them and to the Department of Chemistry.

In addition to the core faculty of the minor, many other campus investigators have strong interactions with the group and will be available as resource persons. These include professors Richard A. Holmer, MD, radiology; Jimmy C. Latimer, DVM, veterinary medicine; Louis A. Corwin, DVM, veterinary medicine; Elmer O. Schlemper, PhD, chemistry; Robert R. Kuntz, PhD, chemistry; and Kurt R. Zinn, DVM, Missouri University Research Reactor.

Radiopharmaceutical chemistry is the science of developing radioactive drugs which can be used by physicians as diagnostic or therapeutic agents. The role of the chemist is the identify and produce radionuclides with suitable nuclear properties, find ways to incorporate those radionuclides in biologically active molecules, and evaluate those molecules in small animals. Drugs which, as a result of these tests, show promise of efficacy in humans are then submitted to clinical trials directed by physicians.

Over the past decade, a nationally and internationally recognized research program in the field has grown at MU. Successes include development of a drug for measurement of cerbral blood flow, radioactive microspheres for the treatment of liver cancer, and radioactive drugs for the treatment of bone cancer. These projects have involved close cooperation among chemistry, medicine, veterinary medicine, Missouri University Research Reactor, and the Truman Veterans Hospital. They have resulted in significant federal, state, and industrial funding. MU is unique among U.S. universities in having available such comprehensive resources in faculty and facilities.

At the same time, an educational component of the program has grown. It has its roots in formal courses offered by the Department of Chemistry, the nuclear medicine technology course in Health Related Professions, and a strong undergraduate research program at MURR. In recent years postdocotral trainees have been added.

Each student will include the following core courses as part of his or her course work: Chemistry 361, Introduction to Radiochemistry; Biological Sciences 328, Introduction to Radiation Biology; Chemistry 335, Nuclear Chemistry or Chemistry 461, Advanced Radiochemistry. Suggested additional electives for PhD students include: Chemistry 461, Organic Spectroscopy; Nuclear Engineering 303, Radiation Safety; Radiologic Science 329, Radiopharmaceuticals in Nuclear Medicine.

ADVISING: The chair of the steering committee for the radiopharmaceutical minor will be the minor adviser for students minoring in radiopharmaceutical chemistry.

Thesis or dissertation projects directly related to radiopharmaceutical chemistry might include, but are not limited to, production and purification of radionuclides at MURR, synthesis of organic chelating agents, chelation chemistry of radioactive metals, and development of analytical methods necessary for quality control. Core faculty members will serve as co-advisers for these theses and dissertations.

Religious Studies

College of Arts and Science
405 General Classroom Building (314)882-4769

FACULTY

Jill Raitt, chairman, professor, PhD, University of Chicago

Joel Brereton, associate professor, PhD, Yale University

Jacob Olupona, associate professor, PhD, Boston University

Sharon Welch, associate professor, director of women studies, PhD, Vanderbilt University

Ronald Farmer, adjunct associate professor, PhD, Southwestern Baptist Theological Seminary

Gilbert Greggs, assistant professor, PhD, Yale University

COURSES

201—Topics (3). To be arranged with instructor.

202—Early Christianity (3). 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: 102 or equivalent.

203—Medieval Christianity (3). 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.

204—History of Christianity, 1500-Present (3). Protestant and Catholic Christianity in age of European expansion; enlightenment; 19th- and 20th-century challenges and responses. Prerequisite: 102 or 203.

211—Ways of Understanding 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. Prerequisite: 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: 102.

217—History of Religion in America to the Civil War (3). Studies major American religious traditions from the Age of Discovery to the Civil War, especially the evolution of religious beliefs 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). Surveys major American religious traditions from 1865 to the present. Focuses on the evaluation of religious beliefs and institutions and their interaction with and influence upon American social, intellectual and political developments.

223—Ancient Judaism: Crisis, Culture and Character in Post-Exilic Israel (3). This course is an introduction to the origin and development of Judaism from the time of the Babylonian exile to the Bar Kockba Revolt. The course examines the political, religious and cultural crises of the Babylonian exile (587-530 BC) and the differing responses of various diaspora communities to those crises. We will examine how the crisis of the exile and restoration transformed Israelite Yahwism into Judaism and we will trace the development of ancient Judaism into various rabbinical schools and dissent sects (Qumran, Hellenizers, apocalypticism, Christianity). The course includes discussion of the institutions and literature of ancient Judaism: the Temple, its priesthood and the rise of the Law and its commentary (Talmud, Mishna, Targumim) and their contribution to western thought and belief. Prerequisites: introduction to the critical study of religion or instructor's consent.

227—Modern Jewish Thought (3). The life and ideas of major modern Jewish thinkers, Moses Mendelssohn, Nachum Krochmal, Hermann Cohen, Martin Buber and Franz Rosenzweig; their impact on European history of ideas. Prerequisite: sophomore standing.

230—Mythology of South Asia (3). Study of the major religious myths of India and their expression in literature and art. Topics: epic mythology, narratives of Krishna, myths and images of Shiva and the forms of the Goddess. Prerequisite: 130 or sophomore standing.

231—Images of Evil (3). Study of the symbols and myths that present the nature and power of evil. Includes examination of the art and literature of both ancient religions and the major scriptural traditions. Prerequisite: sophomore standing.

233—Buddhism (3). (same as South Asian Studies 233). Introduction to Buddhist scriptures, art, practices and institutions. Surveys the history of Buddhism from its origins in India through its development in Southeast Asia, Tibet and East Asia. Prerequisite: junior standing or instructor's consent.

235—Religious Biography (3). The social history and religious experiences of religious founders, prophets, reformers and spiritual leaders. Selection varies. Prerequisite: sophomore standing.

236—Islam and Black America (3). A historical survey of the origins, development and impact of the African-American Islamic tradition. Prerequisite: sophomore standing.

237—Native American Religions (3). Investigation of religious lives of the native peoples of the Americas, from historical background and cultural context to the myths, rituals and symbolism of specific communities. Prerequisite: sophomore standing.

239—Spirituality (2). Comparative investigation of selected mystical writings from Western and Eastern religious traditions; consideration of contemporary psychological, philosophical and phenomenological interpretations of mystical experience. Prerequisite: sophomore standing.

240—The Pentateuch (3). An interpretive seminar applying modern literary critical theory to the interpretation of the narrative literature of the books of Genesis through Deuteronomy. Prerequisite: sophomore standing.

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. Prerequisite: 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. Prerequisite: 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.

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.

245—The Gospel and Epistles of John (3). Study of the Johannine literature in respect to the origins and significance of this school of thought in the development of early Christianity; some comparison of the Gospel of John with the Synoptic Gospels. 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.

248—Biblical Ethics (3). An examination of the major ethical themes found in the Pentateuch, Prophets and Writings of the Old Testament and the New Testament. Prerequisite: 142 or 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.

260—Religious Story and Narrative Truth (3). This course examineds how stories create a world of value through the enchantment of narrative. Particular emphasis will be placed on how relgious stories and their interpretation create an identity for communities. Readings include creation stories of Native Americans, folk and fairy tales, Gilgamesh, Genesis, Gospel of Mark, essays by Gertz, Hauerwas, Kermode, Mary Douglas, Walker Percy, as well as modern short stories. Prerequisite: junior standing or instructor's consent.

271—Modern Literature and the Quest for Values (3). Literary study of religious views and themes expressed in 20th-century poetry, fiction and drama; Eliot, Camus, Kazantzakis, O'Connor, Wiesel, Updike and others. Prerequisites: 102 or equivalent and sophomore standing.

272—Biblical Themes in American Literature (3). A study of the Old and New Testament sources and their reinterpretation in classic American texts. Such a source study, initially textual, results in a history of American ideas. Authors studied include Wright, Faulkner, Steinbeck, MacLeish, Baldwin, O'Connor, Updike and Percy. Prerequisite: sophomore standing.

273—Religion in Afro-American Literature (3). Examination of Afro-American fiction, poetry and drama that present significant racial attitudes toward the Christian religion. Prerequisites: 131 or equivalent, sophomore standing.

275—The Reality of God (3). This course will explore the meaning of "the loss of God" (Tillich) and various 20th-century attempts to reaffirm the reality of God. Prerequisite: sophomore standing.

290—Honors Seminar in Religion (3). To be arranged with instructor.

301—Topics (3).

312—Major Religious Thinkers (3). Concentrated study of one or more selected theologians, such as Augustine, Aquinas, Luther, Calvin, Buber, Tillich and Rahner. Prerequisite: 102 or equivalent or junior standing.

331—Studies in History of Religions (3). Advanced study of problems and theories in the history of religions, with emphasis on the application of working constructs. Prerequisites: 1 and one course in history of religion or equivalent or junior standing.

350—Directed Readings in Religion (1-6). Independent readings selected in consultation with supervisory faculty member. May be repeated up to six hours. Prerequisite: instructor's consent.

399—Senior Seminar (3). This course exercises the Relgious Studies student in methods for understanding and comparing religions through the study of times of significant contact among them; for example, the study of Muslims, Jews and Christians in Medieval Spain.

Romance Languages

College of Arts and Science
143 Arts and Science Building (314)882-4874

FACULTY

Edward J. Mullen, chairman, professor of Spanish, PhD, Northwestern University

Benjamin L. Honeycutt, associate chairman, associate professor of French, PhD, The Ohio State University

Paula Sommers, director of graduate studies, professor of French, PhD, Stanford University

Daniel E. Gulstad, professor of Spanish, PhD, University of Illinois

Marvin Lewis, professor of Spanish, PhD, University of Washington-Seattle

M. Bonner Mitchell, professor of French, PhD, Ohio State University

Ellie Ragland-Sullivan, professor of French, chairwoman of English, PhD, University of Michigan-Ann Arbor

Henry Sullivan, professor of Spanish, PhD, Harvard University

O. Allen Thiher, professor of French, PhD, University of Wisconsin

Michael Ugarte, professor of Spanish, PhD, Cornell University

Magdalena Garcia-Pinto, associate professor of Spanish, PhD, University of Texas-Austin

Mary Jo Muratore, associate professor of French, PhD, University of California-Davis

Glenn P. Pierce, associate professor of Italian, PhD, University of California-Los Angeles

Daniel C. Scroggins, associate professor of Spanish, PhD, University of Michigan

James K. Wallace, associate professor of French, PhD, Vanderbilt University

M. Ellen Blossman, assistant professor of Spanish, PhD, Louisiana State University

Juanamaria Cordones-Cook, assistant professor of Spanish, PhD, University of Kansas

Richard K. Dixon, assistant professor of French, PhD, University of Colorado

Rangira S. Gallimore, assistant professor of French, PhD, University of Cincinnati

Alton Kim Robertson, instructor of French, PhD (pending), University of Texas-Austin

Ana Rueda, assistant professor of Spanish, PhD, Vanderbilt University

Steven Suppan, assistant professor of Spanish, PhD, University of Minnesota

Flore Zephir, assistant professor of French, PhD, Indiana University-Bloomington

DEGREES: MA in Spanish, MA in French and PhD in Romance languages

The Department of Romance Languages offers programs of study leading to master of arts degrees in French or Spanish 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, 130 Jesse Hall, Columbia, Mo. 65211.

Part-time teaching assistantships are available to departmental graduate students. 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 as a result 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: 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 in one of the following fields: a second Romance language, Latin, German, Russian, English, general linguistics, European history, Latin American history, art history, philosophy or education. Other minor fields may be selected subject to departmental approval.

A total of 30 hours selected from courses receiving graduate credit must be completed. In a major-minor combination, a minimum of 20 hours must be in the major subject and a minimum of 10 hours in the minor field. At least 15 hours must be in courses 400 level or above. No more than 12 hours of credit are allowed for 490 research, 400 problems and 350 special readings. A course in the history of the language (French 311 or Spanish 361) must be included in the study program. 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 300-level courses 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, however, students who plan to work for the doctorate are encouraged to write one. The thesis counts for six hours toward the 30-hour requirement.

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. This examination is given in the middle of the fall and winter semesters. Two failures on the final examination eliminates the candidate from consideration for the MA degree. If an official minor is offered, the candidate is examined in both the major and minor fields.

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 first 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). Prerequisite: instructor's consent.

400—Problems (cr. arr.). Prerequisite: instructor's consent.

490—Research (cr. arr.). Prerequisite: graduate standing.

FRENCH

201—Topics (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: sophomore standing, departmental consent for repetition.

203—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.

204—Introduction to French Literature II (3). Study of selected masterpieces of French literature of the 19th and 20th centuries. Prerequisites: 106 and 126.

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. Prerequisite: 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.

226—Advanced Composition and Conversation II (3). Designed to develop skills necessary for modes of writing and sustained conversation. Prerequisite: 206 or 208 or equivalent.

260—French Phonetics (3). A comparison of French and English phonetic features with specific application to French pronunciation. Prerequisite: 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 (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing, departmental consent for repetition.

311—History of the French Language (3) (same as Linguistics 311). Required of MA candidates Prerequisites: 106 and 126.

312—French Medieval Literature (3). Prerequisite: 203 or 204. Recommended: 206.

316—French Renaissance (3). Prerequisite: 203 or 204. Recommended: 206.

317—Seventeenth-Century French Literature (3). Prerequisite: 203 or 204. Recommended: 206.

318—Eighteenth-Century French Literature (3). Prerequisite: 203 or 204. Recommended: 206.

319—Nineteenth-Century French Literature(3). Prerequisite: 203 or 204. Recommended: 206.

320—Twentieth-Century French Novel (3). Prerequisite: 203 or 204. Recommended: 206.

321—Introduction to the Contemporary French Theatre (3). Prerequisite: 203 or 204. Recommended: 206.

323—Introduction to Contemporary French Poetry (3). Prerequisite: 203 or 204. Recommended: 206.

329—Nineteenth-Century French Novel (3). Prerequisite: 203 or equivalent.

350—Special Readings (1-3). Undergraduates must have permission of department chairman. Independent study through readings, conferences, reports. Prerequisite: 203 or 204. Recommended: 206 or equivalent.

352—Foreign Language Teaching Methodology (3). 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.

353—Readings in French (2-3). Subject varies according to instructor. Prerequisite: 203 or 204. Recommended: 206 or equivalent.

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: 203 or 204, and 206 or 208.

378—Structure of Modern French (3) (same as Linguistics 378). An introductory presentation of the phonological and syntactic systems of contemporary standard French. Prerequisite: 206 or equivalent or instructor's consent.

400—Problems (cr. arr.). Prerequisite: graduate standing.

401—Bibliography and Methods (3). Principles and aims of literary scholarship; systematic study of bibliographic resources for research. 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). Prerequisite: graduate standing. Recommended: 312.

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 PhD comprehensive examination in French. Prerequisite: graduate standing.

490—Research (cr. arr.). Prerequisite: graduate standing.

ITALIAN

201—Topics (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

206—Advanced Italian Composition (3). Prerequisite: 106 or equivalent.

207—Intensive Beginning Italian (3). Designed for rapid acquisition of a reading knowledge of Italian. Cannot be taken to fulfill undergraduate language requirement. Prerequisite: graduate standing or instructor's consent.

297—Honors Thesis in Italian (3). Required of honors candidates.

301—Topics (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: junior standing, departmental consent for repetition.

311—Survey of Italian Literature I (3). From 1200 to 1600. Prerequisites: 3, 207 or equivalent.

312—Survey of Italian Literature II (3). From 1700 to present. Prerequisites: 3, 207 or equivalent.

321—Dante (3). Prerequisite: 3 or equivalent.

350—Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisite: 3 or equivalent.

400—Problems (cr. arr.). Prerequisite: graduate standing.

PORTUGUESE

201—Topics (cr. arr.). 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. Prerequisite: graduate standing or instructor's consent.

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. Prerequisite: sophomore standing or instructor's consent.

400—Problems (cr. arr.). Prerequisite: graduate standing.

SPANISH

201—Topics (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisites: sophomore standing and departmental consent for repetition.

203—Introduction to Hispanic Literature I (3). Selected prose fiction and non-fiction prose of Spain and Spanish-America. Prerequisite: 106 or equivalent.

204—Introduction to Hispanic Literature II (3). Selected plays and poetry of Spain and Spanish America. Prerequisite: 106 or equivalent.

206—Advanced Spanish Composition (3). Prerequisite: 106 or equivalent.

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.

209—Advanced Spanish Conversation (3). Prerequisite: 106 or equivalent.

222—Contemporary Culture of Spain (3). Study of Spanish culture and civilization through selected readings in history, literature and contemporary print media. Prerequisite: 3 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 MU's summer study program in Mexico. Prerequisite: sophomore standing or instructor's consent.

260—Phonetics (3) (same as Linguistics 260).

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 (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: junior standing and departmental consent for repetition.

309—Spanish Medieval Literature (3). Prerequisite: 203 or 204.

310—Renaissance and Golden Age Poetry (3). Prerequisites: 203 or 204.

311—Renaissance and Golden Age Prose (3). Prerequisite: 203 or 204.

312—Spanish Theatre in the Golden Age (3). Prerequisite: 203 or 204.

313—Don Quixote (3). Prerequisite: 203 or 204.

317—Spanish Poetry in the Nineteenth and Twentieth Centuries (3). Prerequisite: 203 or 204.

318—Nineteenth-Century Spanish Drama (3). Prerequisite: 203 or 204.

319—Nineteenth-Century Spanish Novel (3). Prerequisite: 203 or 204.

320—Twentieth-Century Spanish Drama (3). Prerequisite: 203 or 204.

321—Twentieth-Century Spanish Novel (3). Prerequisite: 203 or 204.

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: 106 or equivalent. Open only to participants in the MU's summer study in Spain.

323—Advanced Mexican Culture and Civilization (2). Study of Mexican culture and civilization through supervised field work experience. Prerequisite: 3 or equivalent. Open only to participants in MU's summer study program in Mexico.

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: 203 or 204.

325—Techniques of Literary Translation (3). Introduces the history, theory and practice of literary translation. Emphasizes practice. Student is expected to produce a brief, publishable translation. Prerequisite: advanced reading knowledge of Spanish.

331—Survey of Spanish American Literature I (3). From beginning to 1880. Prerequisite: 203 or 204.

332—Survey of Spanish American Literature II (3). From 1880 to present. Prerequisite: 203 or 204.

335—Mexican Literature (3). Prerequisite: 203 or 204.

341—Argentine Literature (3). Prerequisite: 203 or 204.

345—Modernista and Contemporary Poetry (3). Prerequisite: 203 or 204.

350—Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisite: 3 or equivalent. Undergraduates must have departmental chairman's consent.

352—Foreign Language Teaching Methodology (3). 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.

353—Readings in Spanish (2-3). Subject varies according to instructor. Prerequisite: 203 or 204.

355—The Spanish American Theatre (3). Prerequisite: 203 or 204.

356—Stylistics (3).

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: graduate standing.

379—Structure of Modern Spanish (3) (same as Linguistics 379). Synchronic analysis of phonology, morphology and syntax of spoken Spanish dialects. Prerequisite: 103 or equivalent or instructor's consent.

400—Problems (cr. arr.). 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.

425—Techniques of Literary Translation (3). Student should demonstrate familiarity with basic theories of translation and produce a cohesive unit of publishable translations (several short stories, a group of poems, a play). Prerequisite: 325.

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 201 with grade of B or better.

480—Readings (3-6). Independent readings in preparation for PhD comprehensive examination in Spanish. Prerequisite: graduate standing.

490—Research (cr. arr.). Prerequisite: graduate standing.

Rural Sociology

College of Agriculture, Food and Natural Resources
102 Sociology Building (314)882-6357

FACULTY

William D. Heffernan, chair, professor, PhD, University of Wisconsin

Rex R. Campbell, professor, PhD, University of Missouri-Columbia

Edward W. Hassinger, professor, PhD, University of Minnesota

Daryl J. Hobbs, professor, PhD, Iowa State University

Herbert F. Lionberger, professor emeritus, PhD, University of Missouri-Columbia

Robert L. McNamara, professor emeritus, PhD, Ohio State University

Michael F. Nolan, professor, PhD, Pennsylvania State University

David O'Brien, professor, PhD, Indiana University

Alessandro Bonanno, associate professor, PhD, University of Kentucky

Jere L. Gilles, associate professor, PhD, Cornell University

Joel A. Hartman, associate professor, PhD, Pennsylvania State University

John H. Holik, associate professor emeritus, PhD, University of Missouri-Columbia

Kenneth E. Pigg, associate professor, PhD, Cornell University

James R. Pinkerton, associate professor, PhD, University of Wisconsin

J. Sanford Rikoon, research assistant professor, PhD, Indiana University

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 methodlogy with attention to application and policy issues. All students take a core of four courses in statistics, theory, and methodlogy. Areas of specialization in the department are: the sociology of agriculture and natural resources, social change and development, and community studies.

MASTER'S DEGREE: The Department offers two master's degrees. The applied master's degree consists of 44 hours of course work and practicum experience. A thesis is not required. This degree is designed to prepare students for careers in policy and research analysis in national, state, and local government agencies, businesses, and other non-academic settings. A traditional 30 hours master's degree with thesis is also 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 Adward Committee on the basis of 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 stron background in sociology, applications of high merit who do not have such a background are encouraged to apply. At the discreation of the Admissions and Award Committee, such applicants may be required to take such graduate-

level work as is necessary to remedy deficiencies in their background.

In addition to the core of courses for all graduate students, students in the PhD program take a core consisting of an advanced quantitative methods course, and advanced qualitative methods course, and an advanced theory course. Students will specialize by taking at least 9 hours, including a 400 level seminar, in one of the following areas: sociology of agriculture and natural resources, social change and development, community studies.

Students with a BS/BA degree may pursue the PhD program without obtaining a master's degree. In those cases, the student will prepare a research article for submission to a professional journal.

Qualifying examinations are given in June and January. 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. Prerequisite: 1 or Sociology 1 or 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. Prerequisite: 1 or Sociology 1.

214—The Family (3) (same as Sociology 214).

216—Urban Sociology (3) (same as Sociology 216). Prerequisite: 1 or Sociology 1.

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. Prerequisite: 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 before registration. Prerequisites: junior standing, departmental consent.

299—Recent Theories in Sociology (3) (same as Sociology 299).

300—Problems (cr. arr.). 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. Prerequisite: six hours of rural sociology or sociology, or junior standing.

305—Social Demography (3) (same as Sociology 305).

310—Rural Social Organization (3) (same as Sociology 310). Overview of current issues in the study of rural society. Emphasis is on how rural social organization affects agriculture, the introduction of technology and rural development throughout the world. Prerequisite: junior standing.

311—Evaluation and Program Analysis (3) (same as Sociology 311).

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.

340—Community Social Structure (3) (same as Sociology 340).

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 (cr. arr.). Research for student capable of semi-independent work. Prerequisite: instructor's consent.

406—Seminar in Social and Economic Development (3) (same as Sociology 406).

421—Seminar in Population and Human Ecology (3) (same as Sociology 421). Topical seminar on demographic theory, human ecology, migration, underdeveloped areas, fertility or labor force. One topic each semester. May be taken more than once. Prerequisite: 120 or 305.

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. Prerequisite: graduate standing or instructor's consent.

430—Research Methodology (3) (same as Sociology 430).

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—Seminar on Issues in the Sociology of Agriculture (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—Seminar in Comparative Rural Population (3). Comparison of rural populations, causes and consequences of changes in rural populations in the United States and other countries. Prerequisite: 305 or instructor's consent.

447—Seminar on Contemporary Issues in Rural Sociology (cr. arr.).

450—Research (cr. arr.). Research not expected to terminate in thesis or dissertation. Prerequisite: instructor's consent.

480—Special Topics in Sociological Research Methods (1-3) (same as Sociology 480).

490—Research (cr. arr.). Research leading to dissertation.

Social Work

College of Human Environmental Sciences
701 Clark Hall (314)882-0917

FACULTY

Judith Davenport, director, associate professor, PhD, University of Wyoming

Marilyn E. Maddux, director of graduate studies, associate professor, MSW, Washington University

Judith L. Burke, associate professor, PhD, Bryn Mawr College

Joseph Davenport III, associate professor, PhD, University of Wyoming

Bettyann Dubansky, director of undergraduate studies, associate professor, MSW, Washington University

Michael Kelly, associate professor, coordinator of social work extension, PhD, University of Texas-Austin

Larry Kreuger, associate professor, PhD, St. Louis University

O. Duane Kroeker, associate professor, MSW, University of Pennsylvania

Joanne Mermelstein, associate professor, PhD, St. Louis University

Stephen Moore, associate professor, PhD, University of Kansas

Paul A. Sundet, associate professor, PhD, University of Illinois

Erma Ballenger, assistant professor, PhD, University of Nebraska

Wayne Busby, assistant professor, PhD, University of Oklahoma

DEGREE: MSW 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 is a charter member.

Preparation for professional leadership encompasses two major components:

- an in-depth understanding of social science knowledge and an ability to apply behavioral skills in the generic core of social work practice
- 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 preparing students for leadership through two areas of concentration, which include a service function and a field of practice. The two service functions offered are advanced clinical practice and planning and administration, (supervision, consultation, administration, planning and staff development). The two fields of practice currently offered are family (including aging) and children's services and health services (including mental and physical).

Decisions regarding concentrations are made by students in close consultation with faculty advisers. Elective courses, block field instruction and independent study are related to the area of concentration.

The first year of study 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 interactional skills. The second semester focuses on the student's selected role specialization and includes a practicum of two days a week in a social agency.

The second graduate year is organized around specialized concentration studies. Classroom course work comprises the first semester. The second semester is devoted to a practicum related to the student's chosen area of concentration,

usually based outside the immediate Columbia area. Block field placements are in St. Louis, Kansas City, Springfield, Columbia and throughout rural Missouri.

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 to part-time and commuter students. An advanced standing master's program is available to qualified graduates of accredited BSW programs.

Financial assistance is limited.

COURSES

201—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 students and graduate students outside the school.

300—Problems in Social Work (1-3). Research and independent study projects offered on a tutorial basis to undergraduate social work students. Prerequisites: adviser's and instructor's consent.

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.

303—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. Prerequisite: 125 or graduate standing in social work. cor.

304—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. Prerequisites: 125 and junior standing in social work.

306—Introduction to Social Work Practice (3). Introductory, generic practice theory course promoting student's understanding of professional social work practice as holistic, identifiable, unique configuration of knowledge, values and skills. Prerequisite: junior standing in social work.

307—Delinquency, Corrections and 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.

309—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.

312—Research Methods for Social Work (3). Survey of research methods germane to the development of the knowledge base of social work practice. Prerequisite: senior or graduate standing in social work.

313—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.

320—Social Psychological Perspectives in Human Development for Social Work (3). Substantive sources from behavioral sciences used in social work toward understanding the biosocial processes and constraints of human development. Prerequisite: graduate standing.

321—Social Deviance (3). Basic concepts and principles regarding psychological/social dynamics of deviance; implications for social welfare policy and social interventions. Prerequisite: senior or graduate standing or instructor's consent.

323—Behavioral Foundations for Social Work Administration (3). Examination of relevant theoretical and behavioral foundations in order that students can acquire the knowledge to function more rationally and at a higher level as a social work administrator. Prerequisite: graduate standing.

325—Alcoholism Treatment and Prevention (3). Provides knowledge generic to social work and other disciplines involved in alcoholism treatment. Integrated services approach to problems of alcoholism will be emphasized. Didactic and experiential methods employed; development of self-awareness is stressed.

326—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.

328—Working with Minority Youth (3). 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.

330—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. Prerequisite: junior or graduate standing in social work.

331—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.

350—Special Readings (1-3). Extensive readings in selected area or intensive reading in a special field. Prerequisites: adviser's and instructor's consent.

360—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: 306, 330 and senior standing in social work. Co-requisite: 390.

361—Strategies of Clinical Social Work Intervention (3). Strategies of social treatment with individuals and small groups, with emphasis on processes of supportive counseling used in public service agencies. Prerequisite: graduate standing in social work.

363—Fundamentals of Social Work Administration (3). Basic managerial skills that 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.

370—Law and Social Work Practice (3). Legal processes and law relevant to social policy and social work practice. Legal procedures, court testimony, case method, study of decisions affecting major social problems. Prerequisite: senior or graduate standing in social work.

380—Social Work Practice With Minorities Afro-American Emphasis (3). Provides students with an appreciation of the black experience in the United States on a knowledge and feeling level. Prerequisite: instructor's consent.

385—Helping Strategies With Children and Adolescents (3). Major approaches in theory and practice of work with children and adolescents. Including an historic contemporary perspective of such practice with a focus on social learning theory, client-centered theraphy, cognitive theraphy and their application. Prerequisite: senior standing.

390—Interventive Processes I (6). Supervised social work practice in a school-approved agency focusing on development of direct practice skills. Fall semester, three days a week. S/U graded only. Prerequisites: senior standing in social work, 125, 303, 304, 306, 330, 331 and 321. Co-requisites: 360 and 394.

391—Interventive Processes II (1-6). Supervised social work practice in a school-approved agency, providing a full range of interventive experiences. Winter semester, two or three days a week. S/U graded only. Prerequisites: admission to MSW program, 303, 309, 313, 320 and 330.

394—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. Prerequisites: 360 and 390.

400—Problems (1-6). Intensive study of an area of social welfare related to special interest of student. Prerequisites: adviser's and instructor's consent.

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. For graduate students only.

402—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.

405—Social Work Practice in the Health Field (3). Focus is on the aspects of social work processes in the context of physical and mental health service organizations. Prerequisite: graduate standing.

406—Health Policies and Programs (3). Graduate seminar on policies and programs relevant to social work in the health field, including physical health, rehabilitation and mental health. Prerequisite: graduate standing.

407—Social Work Practice in the Family and Child Welfare Field (3). Focus is on the unique aspects of social work practice in the family and child welfare service organizations. Prerequisite: graduate standing.

408—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. Prerequisite: graduate standing.

410—Professional Practice Seminar I (3). Provides integrative learning experience in social work practice in an area of beginning specialization in autonomous social work practice. Prerequisite: graduate standing in social work. Co-requisite: 491.

412—Research Design 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: graduate standing.

413—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 or cognitive, affective and behavioral functioning. Prerequisite: 412.

414—Evaluative Research in Social Work Planning and Administration (3). Develop ability to design and implement appropriate evaluative research methods and strategies employed in social and human service program planning and management.

421—Advanced Behavioral and Clinical Foundations of Human Behavior (3). Examines prevailing models of clinical and social classification, with emphasis given to issues of reliability, validity, etiology and treatment. Prerequisite: graduate standing.

430—Community Organization for Social Welfare (3). The theory and practice of community organization as a social work problem solving method. Approaches emphasized include locality development, social planning and social action. Prerequisite: graduate standing in social work.

431—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, 330 and instructor's consent.

432—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.

435—Management of a Social Agency (3). Basic resource management and control techniques common to social agencies with emphasis on personnel management, information and data management and fiscal management. Prerequisites: 363 and graduate standing.

440—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.

450—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 written report in publishable format. Prerequisites: 412 or equivalent and graduate standing.

490—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. Prerequisites: 412 and graduate standing.

491—Professional Leadership Practice (1-13). Field instruction tailored to concentration and specialization interests, developing depth in clinical skills in direct service or in administration, staff development and supervision. With few exceptions students leave the Columbia area. Prerequisite: completion of all required graduate course work except 410. Co-requisite: 410.

492—Practicum in Cultural Diversity I (1). A practicum conducted on a workshop format with content focused on racial, cultural and gender dynamics in social work practice. Required first year graduate students. S/U graded only.

493—Practicum in Cultural Diversity II (1). Continuation of 492. A practicum conducted on a workshop format with content focused on racial, cultural and gender dynamics in social work practice. Required for first year graduate students. S/U graded only.

Sociology

College of Arts and Science
109 Sociology Building (314)882-8331

FACULTY

Andrew C. Twaddle, chairman, professor, PhD, Brown University
Edward E. Brent, director of graduate studies, professor, PhD, University of Minnesota
J. Kenneth Benson, professor, PhD, University of Texas
Bruce J. Biddle, professor, PhD, University of Michigan
John F. Galliher, professor, PhD, University of Indiana
Donald O. Grangerg, professor, PhD, Pennsylvania State University
Peter M. Hall, professor, PhD, University of Minnesota
Richard M. Hessler, professor, PhD, University of Pittsburgh
James L. McCartney, professor, PhD, University of Minnesota
C. Edwin Vaughan, professor, PhD, University of Minnesota
Ted R. Vaughan, professor, PhD, University of Texas
Robert W. Habenstein, professor emeritus, PhD, University of Chicago
Hans O. Mauksch, professor emeritus, PhD, University of Chicago
Barbara J. Bank, associate professor, PhD, University of Iowa
Clarence Y. Lo, associate professor, PhD, University of California-Berkeley
Mary Jo Neitz, associate professor, PhD, University of Chicago
Michael D. Woodard, assistant professor, PhD, University of Chicago
Darlaine C. Gardetto, instructor, MA, University of California-Davis
Katherine Lyman, instructor, MA, Stanford University

DEGREES: MA and PhD in sociology

The Department of Sociology offers graduate work designed to teach the application of the perspectives 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 heart of graduate training is in theory and methods. Students may specialize in Social Psychology, Organizations and Occupations, Social Inequality, Political Economy, Social Movements and Change, Social Institutions, and Social Control. Substantive interests (e.g. Sociology of Health, Family, gender issues) can be accomodated within those specialty areas.

The department has ties to the Center for Research in Social Behavior, the Center for Aging Research, and the School of Medicine.

Financial support for students includes teaching assistantships and research assistantships.

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 scores from either the GRE or the Miller Analogy Test.

The MA in sociology may be taken on a thesis or a non-thesis plan. Both plans require completion of 405, 430, 376, three courses designated as "MA core" and additional course work for a total of 30 (thesis option) or 40 (non-thesis option) hours. Completion of a satisfactory thesis is required for those who wish to be considererd 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 before their first semester of registration for a diagnostic interview, at which time the specific steps to remedy deficiencies will be specified.

The PhD program is being revised as of this writing. It will involve a minimum of 30 hours of course work beyond the MA degree, including additional work in theory and methods, and 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.

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. Prerequisite: 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.

211—Criminology (3). Sociology of law; constitutional, psychological, sociological theories of criminal behavior; process of criminal justice; treatment of corrections; control of crime.

212—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. Prerequisite: 211 or instructor's consent.

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. Prerequisite: 1 or 4 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. Prerequisite: 1 or 4 or equivalent.

216—Urban Sociology (3) (same as Rural Sociology 216). Urbanism as 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. Prerequisite: 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. Prerequisite: 1 or equivalent or instructor's consent.

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: one course in sociology.

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. Prerequisite: 1 or 4 or equivalent.

260—Social Psychology (3) (same as Psychology 260).

262—Sociology of Sex Roles (3). Examinations 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. Prerequisite: 1 or 60 or equivalent.

270—The Sociology of Religion (3) (same as Religious Studies 270 and 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: senior sociology major.

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 before registration. Prerequisites: junior standing and instructor's consent.

298—The Rise of American Sociology (3). Historical survey of significant 19th- and early 20th-century developments in American sociology; emphasis on emergence of sociology

in American universities. Prerequisite: 12 hours of sociology.

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. Prerequisite: 12 hours of sociology.

301—Topics in Sociology (cr. arr.). 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.

302—Social Studies of Science (3). Effects of social, political, economic and cultural factors on science. Organization of science into work groups and disciplines. Communication patterns in science. Influences on problem choice and discovery. Ethics in scientific research. Prerequisite: 1 or 4 or equivalent.

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.

311—Evaluation and Program Analysis (3) (same as Rural Sociology 311). Development of analytic skills for diagnosis of social problems and formation, implementation, evaluation of public policy. Prerequisite: 375 or equivalent.

321—Expert Systems (3). Introduction to 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: six 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.

324—Sociological Concepts and Health (3). Examination of sociological concepts and data as related to health field; introductory analysis of field of medical sociology. Prerequisite: junior, senior, or graduate standing.

333—Social Organization (2-3). Survey of approaches to the analysis of social organization, emphasizing complex organizations, division of labor, social inequality, politics and the state, social change. Prerequisite: 210 or graduate standing.

335—Social Change and Trends (3) (same as Rural Sociology 335).

336—Social Movements and Conflicts (3). Survey of approaches and research on social movements and social change. Historical and contemporary social movements in the United States; collective protest and violence; political revolutions. Prerequisites: 1 or 4, and junior standing.

337—Race and Ethnic Relations (3). The experience of racial and ethnic minorities; inequality, assimilation, ethnic and racial conflict, accommodation. Prerequisites: 1 or 4 or equivalent and junior standing.

343—Advanced Social Psychology (3) (same as Psychology 343). Major theoretical fields and their application to human problems. Prerequisite: 260 or instructor's consent.

344—Group Dynamics and Role Theory (3) (same as Psychology 344).

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 relationships. Prerequisite: 260 or instructor's consent.

350—Special Readings (cr. arr.). Extensive reading in selected area or special field. Prerequisites: 12 hours of sociology and 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.

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. Prerequisite: 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. Prerequisite: 180 or equivalent.

371—Attitude Change (3) (same as Psychology 371).

372—Social Organization of the Advanced 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. Prerequisite: junior standing.

375—Social Statistics (3) (same as Rural Sociology 375).

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 or equivalent.

400—Problems (cr. arr.). Directed research not leading to thesis or dissertation. Prerequisites: 12 hours of sociology and departmental consent.

403—Professional Problems (1-3). Problems of training, teaching, non-academic employment, professional organization, ethics. Prerequisite: graduate standing in sociology or rural sociology.

405—Theories of Society (3). Fundamental theoretical developments in modern sociology seen as an empirical discipline. Required for MA students. Prerequisite: 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. Prerequisite: 333 or instructor's consent.

411—Seminar in Sociology of Work (2). Recent developments in the sociological study of occupations and professions. Surveys alternative theoretical perspectives and methodological approaches. Deals with rationalization, professionalization, alienation, class consciousness and 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. Surveys alternative theoretical perspectives and methodological approaches.

420—Independent Readings in Preparation for Comprehensive Examinations (1-6). Independent readings for PhD comprehensives. Open only to PhD candidates who have passed qualifying examinations. Prerequisite: consent of major adviser.

425—Communication and the Diffusion of Information (3) (same as Rural Sociology 425).

428—Seminar on Race Relations (3).

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 and 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.

431—Seminar in Multivariate Analysis Techniques (3) (same as Rural Sociology 431). Examination of various quantitative techniques of data analysis. Prerequisite: 430 or instructor's consent.

432—Seminar in Qualitative Methods in Sociology (3) (same as Rural Sociology 432). Examination of various qualitative methods of research, including problem-formulation, access and interpretation of data, theory-generation, and preparation of research reports. Prerequisite: 430 or instructor's consent.

433—Seminar in Social Psychology I (3) (same as Psychology 433).

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 the United States since 1950. Recent formulations and 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.

450—Research (1-6). Research not expected to terminate in thesis or dissertation. Prerequisite: instructor's consent.

456—Seminar on the Sociology of Health and Sickness (3). Topical seminar dealing with one of three subject areas (1) health problems disease, illness, sickness; (2) occupations and organizations in the health field or (3) comparative health-care systems. Course may be repeated for different topics. Prerequisite: graduate standing.

468—Seminar in Social Gerontology (2-3). Analysis of selected topics in the sociological study of age; critical issues; research literature and methodologies; development of theory. Prerequisite: 322 or instructor's consent.

480—Special Topics in Sociological Research Methods (1-3) (same as Rural Sociology 480). Organized study of selected research topics. Subjects and earnable credit may vary across semesters. Prerequisites: 430 or equivalent, departmental consent for repetition.

490—Research (cr. arr.). Advanced work leading to thesis or dissertation. Prerequisite: consent of major adviser.

Soil Science

School of Natural Resources
144 Mumford Hall (314)882-6301

See Natural Resources for description of programs.

South Asia Language and Area Studies

437 General Classroom Building (314)882-3065

FACULTY

Bina Gupta, chairwoman, associate professor of philosophy and South Asian languages, PhD, University of Southern Illinois

Robert Bussabarger, professor of art, MA, Michigan State University

Peter Gardner, professor of anthropology, PhD, University of Pennsylvania

Murari L. Nagar, professor emeritus, South Asian librarian, DLS, Columbia University

Arthur Robins, professor 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

William A. Noble, associate professor of geography, PhD, Louisiana State University

Joe Astroth, assistant professor of geography, PhD, University of Chicago

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. In addition to the graduate degree, a certificate of specialization is awarded in conjunction 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 South Asia program at MU formally was designated a language and area center under the National Defense and Education Act in 1965. In addition, 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 located in the Museum of Art and Archaeology.

DEGREE 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, in addition to departmental requirements. Remaining requirements are established so as to provide maximum flexibility to the student's goals and prior 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 Asia 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 (3) (same as Religious Studies 233).

245—Nonviolence in the Modern World (3) (same as History 245 and Peace Studies 245). Readings on recent world history, emphasis on Gandhi and non-violent tradition in America Europe and the Third World. Prerequisite: sophomore standing. Intensive writing 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 (cr. arr.). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: departmental consent for repetition.

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).

400—Problems (3) (same as History 400).

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 knowledge in Indian philosophy in relation the Advaita Vedanta system of Samkara. Prerequisite: graduate standing.

Special Education

College of Education
310 Townsend Hall (314)882-3741

FACULTY

Sharon Huntze, chairman, assistant professor, EdD, University of Missouri-Columbia

James E. Leigh, director of graduate studies, professor, PhD, University of Southern California

Reuben Altman, professor, PhD, University of Texas

Robert F. Busch, professor, PhD, University of Missouri-Columbia

Patrick J. Schloss, professor, PhD, University of Wisconsin

Sandra Alper, associate professor, PhD, University of Iowa

Marilyn Chandler, associate professor, PhD, University of Iowa

Michael Pullis, associate professor, PhD, University of California-Los Angeles

Lynda L. West, associate professor, PhD, University of Missouri-Columbia

DEGREES: MA or MEd in special education, with emphasis areas in behavior disorders, curriculum development for exceptional students, early childhood special education, learning disabilities, and mental retardation; EdSp in special education with emphasis areas in administration and supervision of special education, behavior disorders, curriculum development for exceptional students, learning disabilities, and mental retardation; EdD or PhD in special education with emphasis areas in administration and supervision of special education, behavior disorders, curriculum development for exceptional students, early childhood special education, learning disabilities, and mental retardation

These graduate programs prepare teachers and leadership personnel in a variety of areas within special education. Program graduates assume roles as resource room teachers, teachers in self-contained units, consulting teachers, college professors, public and private school administrators and leaders in state and federal governmental agencies. Programs meet individual student's needs and interests within the framework of the requirements of each specific degree.

See **Education** in this section for general information.

Additional information may be obtained from the Director of Graduate Studies, Department of Special Education, 310 Townsend Hall, Columbia, Mo. 65211.

COURSES

L299—Student Teaching in Special Education (cr. arr.). Credit must be arranged before preregistration. Application should be made in term preceding registration. Prerequisite: curriculum/methods course(s) in area of specialization.

L321—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. Prerequisites: L339 or Educational & Counseling Psychology A205.

L322—Secondary Methods in Special Education (3). Characteristics and program needs unique to adolescents and adults with mental or physical disabilities. Emphasis on community-based educational, vocational, residential and leisure programs.

L323—Curriculum for Severely Handicapped Students (4). 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. Prerequisites: L321 and L339.

L324—Assessment of Functional Skills of Severely Handicapped Students (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: L321 and L339.

L325—Functional Skills Programming (3). Identification, assessment and instruction of skills that are required by people with mental or physical disabilities in order to function successfully in a variety of educational, vocational and domestic settings. Prerequisite: L339.

L330—Teaching the Mentally Retarded (3). Study of learning characteristics, evaluation, teaching techniques and methods and curriculum adaptations for mentally retarded. Prerequisite: L321.

L334—Introduction to Severely Handicapped (3). Study of historical events, legislation, causal factors, identification, and programs related to persons with severe handicaps. Emphasis on education and related services enabling these individuals to participate in integrated settings. Prerequisite: L339.

L335—Managing Health Problems of Handicapped Students (3). Provides prospective teachers, rehabilitation personnel, and recreation specialists with information regarding managing the health related problems of handicapped persons. Emphasis is on the provision of services within an integrated therapy model.

L339—Education of Exceptional Students (3). Study of special children and youth characteristics, prevalence, etiological background, legal ramifications and programmatic considerations, such as methodological approaches, staff roles and responsibilities and IEPs. cor.

L342—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: L339 and Educational and Counseling Psychology A205.

L343—Methods in Teaching the Learning Disabled (3). Emphasis on development of appropriate instructional plans for students with learning disabilities, curriculum development and goal setting, prescriptive and individualized instruction, specialized techniques and methodologies of teaching.

L346—Language Development of Exceptional Students (3). Language acquisition and development, standardized and informal assessment methods and instruments and language intervention programs and strategies for exceptional students. Prerequisite: L339.

L351—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. Prerequisite: L339 or Educational and Counseling Psychology A205.

L352—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.

L353—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.

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 and Counseling Psychology A205.

L361—Psychoeducational Assessment of Exceptional Students (3). Study of procedures and instruments used in the assessment of exceptional students, including both standardized and informal measures of intellectual capacity, academic achievement, language, social-emotional behaviors and correlate areas. Prerequisites: L339 and junior standing.

L362—Psychoeducational Assessment of Exceptional Students-Laboratory (2). Structured experience in administration and interpretation of standardized and informal assessment instruments with exceptional students. Prerequisite: L361 or concurrently.

L363—Behavioral Management with Exceptional Students (3). Acquaints students with the theory and practice of procedures for effective behavioral intervention in the education of exceptional students. Prerequisites: L339 and junior standing.

L364—Behavioral Management with Exceptional Students-Laboratory (2). An opportunity to gain practical experiences in application of behavioral management and intervention procedures with exceptional students. Prerequisite: L363 or concurrently.

L365—Instructional Programming for Exceptional Students (3). Orientation to theoretical and pragmatic aspects of curriculum development and instructional programming with exceptional students. Prerequisites: L339 and junior standing.

L367—Use of Instructional Materials With Exceptional Students (3). Identification, development, evaluation of materials and media appropriate for instruction of exceptional students. Prerequisites: L339 and junior standing.

L371—Vocational Education for Handicapped Students (3) (same as Practical Arts and Vocational-Technical Education 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 and Disadvantaged (1-2). 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.

L379—Consultation and Conferencing in Special Education (3). This course is designed to help students develop competency in interviewing and conferencing with parents concerning their responsibilities toward their children with special needs. Prerequisite: L339.

L381—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. Prerequisites: L339 and junior standing.

L400—Problems in Special Education (cr. arr.).

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: L339 and instructor'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 historical, significant 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—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. Prerequisite: L342 or instructor's consent.

L424—Programmatic Approaches to Education of Children with Behavioral 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.

L425—Psychological and Sociological Aspects of Mental Retardation (3). Study of psychological and sociological factors germane to the study of mental retardation including learning characteristics and mental retardation explored as a sociological phenomenon. Prerequisites: admission to graduate study and instructor's 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. Prerequisite: 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.

L490—Research in Special Education (cr. arr.).

Statistics

College of Arts and Science
222 Math Sciences Bldg. (314)882-6376

FACULTY

Robert K. Tsutakawa, chairman, professor, PhD, University of Chicago

Frederick Williams, associate chairman, professor, PhD, Northwestern University

Farroll T. Wright, director of graduate studies, professor, PhD, University of Missouri-Columbia

Asit P. Basu, professor, PhD, University of Minnesota

John E. Hewett, professor, PhD, University of Iowa

Shriniwas K. Katti, professor, PhD, Iowa State University

Gary F. Krause, professor, PhD, Virginia Polytechnic Institute

Richard W. Madsen, professor, PhD, Iowa State University

William A. Thompson Jr., professor, PhD, University of North Carolina

Wallace E. Franck, associate professor, PhD, University of New Mexico

James E. Holstein, associate professor, PhD, University of Iowa

Paul L. Speckman, associate professor, PhD, University of California-Los Angeles

Jon Maatta, assistant professor, PhD, Cornell University

Shwu-Rong (Grace) Shieh, assistant professor, PhD, University of Wisconsin-Madison

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 computational resources of the Department of Statistics include access to the campus IBM 3090, the University Network which includes an IBM 3081 and related auxiliary equipment. In addition, the department has a network of Macintosh SE's, IBM PC's and AT's, as well as laser printers available for student use. A large library of computer programs and subroutines is available.

The mathematical sciences building houses the departments of mathematics, statistics and computer science, the University computer network and the mathematical sciences library. The library has an outstanding collection of books and journals pertaining to mathematics, statistics and computer science.

Fellowships and teaching and research assistantships are available to qualified graduate students. ***For further information, write the Director of Admissions, Department of 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, as well as other criteria bearing on qualifications. Ordinarily students should have close to a 3.0 GPA (A=4.0) in mathematics and statistics courses in order to enter the master's degree program, and close to a 3.5 GPA in mathematics and statistics in order to become PhD candidates. The Department of Statistics recommends 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 of the 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 listings of the Department of Statistics. 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 listing of the Department of Statistics. 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 a 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 exam of the material presented in the written report, seminar and over course work.

Additional courses recommended but not required are 416, 463, 464 and 465; Math 311; Computer Science 103 or 201.

The accumulation of nine credit hours with a grade of C or lower on a program for the degree ordinarily terminates a student's candidacy. If a student receives six hours of C in courses offered by the department in the degree program, candidacy for the degree is terminated, unless action to the contrary is taken by 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.

DOCTORAL DEGREE: To enter the PhD program in statistics a student must pass the qualifying examination. The qualifying examination usually will take place in early fall. The examination will be based on Statistics 325, Statistics 326 and other 300-level courses. There will be two papers — one on statistical theory and one on applied statistics. Typically, a student will take the examination at the beginning of the second year. 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.

After 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 examination before 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 (offered as Statistics 452 in F90) and 464 (or Statistics 423). The second paper will be based on three other 400-level courses, not including the seven courses listed above, chosen by the student in consultation with his doctoral program committee. 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.

250—Introduction to Probability and Statistics II (3). Continuation of 150. Estimation; hypothesis testing; regression; correlation; statistical decision theory; Bayesian inference. Prerequisite: 150.

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. Prerequisites: Mathematics 10 and graduate standing or instructor's consent.

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.

301—Topics (cr. arr.). 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.

304—Statistical Methods I (3). Introductory course on statistical methods with emphasis on assumptions and effects of violating those assumptions. Computer packages used to analyze data. Applications to real problems will be stressed. Prerequisite: Mathematics 80 or instructor's consent.

307—Non-parametric 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 250 or 315 or 320 or equivalent.

315—Elements of Probability and Statistics (3). Primarily for mathematics education students. Introduction to probability, random variables, expectations, descriptive statistics, estimation, hypothesis testing and regression. Introduction to materials for secondary school use. No credit for both 315 and 320. Prerequisite: Mathematics 175.

320—Introduction to Mathematical Statistics (3) (same as Mathematics 320). Introduction to theory of probability and statistics using concepts and methods of calculus. No credit for both 315 and 320. Prerequisite: Mathematics 201 or instructor's consent.

325—Introduction to Probability Theory (3) (same as Mathematics 325). Probability spaces; random variables and their distributions; repeated trials; probability limit theorems. Prerequisite: Mathematics 201 or instructor's consent.

326—Statistical Inference I (3) (same as Mathematics 326). Sampling; point estimation; sampling distribution; tests of hypotheses; regression and linear hypotheses. Prerequisite: 325.

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.

329—Applied Probability (3). Probability in its applied context. Designed for seniors and beginning graduate students. Construction of probability models. Examples in physical and behavioral sciences. Multivariate normal and exponential distributions, extreme value distributions, stochastic processes, queuing. Prerequisite: 325 or equivalent.

345—Categorical Data Analysis (3). Discrete distributions, frequency data, multinomial data, chi-square and likelihood ratio tests, logistic regression, loglinear models, rates, relative risks, random effects, case studies. Prerequisites: 326 and working knowledge of one computer programming language.

360—Deming Philosophy and Statistical Process Control (3). Statistical control charts, economic design of control charts, acceptance sampling, pareto chart and other graphical procedures, Deming philosophy, Taguchi methods. Prerequisite: 320 or 326 or instructor's 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. Prerequisite: 207 or 250 or 315 or 320 or 326.

375—Operations Research (3). Study of mathematical and statistical models employed in operations research. Prerequisite: 207 or 250 or 315 or 320 or 326.

380—Statistical Forecasting (3) (same as Management

380, Marketing 380 and Finance 380).

385—Regression and Correlation Analysis (3). Measurement of relationships among variables including multiple regression, partial correlation and some non-parametric methods. Prerequisites: 207 or 250 or 315 or 320 or 326 and Mathematics 80.

395—Analysis of Variance (3). Problems of measuring separate and joint effects of two or more factors on results of an experiment. Prerequisite: 207 or 250 or 315 or 320 or 326.

400—Problems and Special Readings (cr. arr.). Approved reading and study, independent investigations and reports on approved topics. Prerequisites: graduate standing and instructor's consent.

403—Mathematical Statistics I (3). Multivariate distributions. Multivariate normal. Non-central t, chi-square and F distributions. Asymptotic distributions of maximum likelihood estimators, goodness-of-fit statistics and likelihood ratio test statistics. Information and locally best tests. Prerequisites: 326, Mathematics 310 and 331, or instructor's consent.

404—Mathematical Statistics II (3). Theory of estimation and tests of hypotheses, including sufficiency, completeness and exponential families. Neyman-Pearson lemma, uniformaly most powerful tests, similarity and invariance. Minmax, Bayes and uniformly minimum variance unbiased estimates. Confidence intevals and ellipsoids. Prerequisite: 403 or instructor's consent.

411—Statistics Seminar (cr. arr.).

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 and 395, instructor's consent.

420—Bayesian Statistics (3). Bayes theorem,subjective probability as a measure of belief, likelihood principle, noninformative priors, conjugate priors, nuisance parameters, statistical decision, backwards induction, stable estimation, Bayesian hypothesis testing, applications. Prerequisites: 326, Mathematics 302 and 331.

423—Experimental Design (3). Examination and analysis of modern statistical techniques applicable to experimentation in social, physical or biological sciences. Prerequisite: 395 or instructor's consent.

430—Reliability Theory and Survival Analysis (3). Statistical failure models. Parametric life test procedures. Nonparametric life test procedures. Bayes methods. System Reliability. Accelerated life testing. Kaplan-Meier estimator. Cox's regression model. Prerequisite: 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, Mathematics 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 (cr. arr.). 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 that are currently under development, such as bootstrapping, missing data, non-parametric regression, statistical computing. 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 diagnostics, ridge and non-linear regression). Prerequisites: 326 or 320, Math 331 and instructor's consent.

464—Linear Models II (3). Theory and application of analysis of variance (crossed classification, blocking, contrasts 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, Mathematics 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, Mathematics 302 and 331.

470—Theory of Nonparametric Statistics (3). Estimation, hypothesis testing, confidence intervals. when functional form of the population distribution is unknown. Prerequisite: 403 or instructor's consent.

490—Research (cr. arr.).

Textile and Apparel Management

College of Human Environmental Sciences
137 Stanley Hall (314)882-7317

FACULTY

Kitty Dickerson, chairwoman, professor, PhD, St. Louis University

Nancy Fair, associate professor, PhD, North Carolina State University

Jean Hamilton, associate professor, PhD, University of Missouri-Columbia

Usha Chowdhary, assistant professor, PhD, Ohio State University

Betty Dillard, assistant professor, PhD, University of Missouri-Columbia

Pamela Norum, assistant professor, PhD, Cornell University

Laurel Wilson, assistant professor, PhD, University of North Carolina-Greensboro

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 may emphasize the following areas of study: textile/apparel economics and international trade, consumer issues, marketing/merchandising, behavioral/historical studies in dress, clothing for special needs and applied textile science.

Career opportunities for graduates exist in many areas, such as cooperative extension, higher education, industry analysis, museums and product development.

See **Human Environmental Sciences** for general information.

Additional information may be obtained from the Chairwoman, Department of Textile and Apparel Management, 137 Stanley, Columbia, Mo. 65211.

COURSES

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 and 182.

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 also are discussed. Prerequisite: three credits of merchandising, marketing or microeconomics.

286—Textile Analysis (3). A comparative study of the properties of fibers and fabrics, and how these influence the performance of apparel and household textiles. Laboratory experience. Prerequisite: 182 and Chemistry 1.

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 (cr. arr.). Prerequisites: junior standing and instructor's consent.

318—Topics (cr. arr.). Selected current topics in field of interest.

345—History of Textile Manufacturing and Trade (3). History of technological developments from prehistoric times to the present and how trade facilitated the transfer of both technology and design from culture to culture. Prerequisites: 182 or 187 or instructor's consent.

350—Readings (cr. arr.). Prerequisites: senior standing and instructor's consent.

355—Recent Trends (1-3). For upperclass and graduate students who wish additional knowledge and understanding in specific subject matter areas.

381—19th- and 20th-Century Western Dress (3-4). A study of 19th- and 20th-century Western dress as influenced by time, place and culture.

384—Textile and Apparel Economics (3). Economic aspects of the textile and apparel industries and how these impact upon merchandising and consumption of end-use products. Prerequisites: 86, Economics 51 or equivalent, junior standing.

385—Textile Fibers (3). Advanced study of textile fibers; emphasis on their structure, composition, physical and chemical properties. Prerequisites: 182 and six hours of 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 and Marketing 204.

388—Clothing, Behavior, and Society (3). Behavioral aspects of clothing as related to the individual and society. Prerequisites: 83, 86 and two courses from sociology, psychology or economics.

389—Clothing for People with Special Needs (3). Specialized clothing problems of the physically/visually handicapped and elderly. Psycholgical implications analysis of clothing problems and role of accessibility in garment acquisition.

390—Field Training (cr. arr.). Internship practical aspects of 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 (cr. arr.). 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.

415—Readings (cr. arr.). Readings in recent research material in textiles and clothing. Prerequisites: graduate standing, 20 hours of textile and apparel management and instructor's consent.

418—Topics (cr. arr.). Selected current topics in field of interest.

430—Survey of Research in Textile and Apparel Management (3). A survey of current research in textile and apparel management. Underlying theory, research design and empirical techniques are analyzed and critiqued. Prerequisites: graduate standing, three hours in statistics and three hours in research methods.

450—Research (cr. arr.). 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 and senior or graduate standing.

481—Textile Material Culture (3). An investigation of

theories and methods used in the study of material culture with application of appropriate material culture theories and methods to textile and costume artifacts in seminar format. Prerequisites: 381, 345 or instructor's consent.

484—International Trade in Textiles and Apparel (3). Economic, social and political aspects of international production and trade of textiles and apparel. Prerequisites: 384, Economics 326 or instructor's consent.

488—Cultural Interpretations of Dress and Adornment (3). Diversity in functions and patterns of dress and adornment. Prerequisite: 388 or instructor's consent.

490—Research (cr. arr.). Independent research leading to thesis or dissertation.

Theatre

College of Arts and Science
129 Fine Arts Center (314)882-2021

FACULTY

Clyde Ruffin, chairman, associate professor, MFA, University of Iowa

Carla Waal, director of graduate studies, professor, PhD, Indiana University

Stephen M. Archer, professor, PhD, University of Illinois

Larry D. Clark, Dean of the College of Arts and Science, professor, PhD, University of Illinois

Weldon B. Durham, Associate Dean of the Graduate School, professor, PhD, University of Iowa

Patrick Atkinson, associate professor, MFA, Illinois State University

Suzanne Dieckman, associate professor, PhD, University of Michigan

Richard Klepac, associate professor, PhD, University of Missouri-Columbia

James Miller, associate professor, MFA, Southern Mississippi University

Dean Packard, technical 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 by course work and participation in the University Theatre and Summer Repertory Theatre.

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. Students with low GPAs may apply for admission on probation.

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 and at least three letters of recommendation.

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
- additional course work and foreign language requirements
- written and oral comprehensive examinations
- completion of a dissertation agreed to by the student's program committee
- an oral defense of the dissertation

FOREIGN LANGUAGE REQUIREMENT

For information on how to satisfy the foreign language requirement, see the Department of Theatre Graduate Handbook.

COURSES

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.

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, resonance, and nonregional articulation.

243—Acting I (3). Basic theory, practice of acting, stage movement.

244—Acting II (3). Play analysis for the actor. Theories of characterization. Individual and group rehearsal, performance. Prerequisite: 243 or instructor's consent.

251—Beginning 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.

254—Scene Design I (3). Beginning scenic design stressing graphics for the stage. Includes units on drafting, perspective drawing and rendering. Prerequisite: 152 or instructor's consent.

261—Theatrical Directing (3). Theory and practice of play directing; script selection, casting, play analysis, rehearsal and performance. Prerequisite: 60.

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.

280—Internship (1-3). Experiental learning as an actor, designer, technician, publicist/manager, or dramaturg with an approved theatre company. S/U graded only. Prerequisites: junior/senior standing and departmental consent.

296—Honors in Theatre (2). Special work for honors candidates in theatre.

297—Honors in Theatre (2). Special work for honors candidates in theatre.

311—Beginning Playwriting (3) (same as English 311). Study and practice of playwriting fundamentals; emphasizes the one-act play. Prerequisites: English 60 and junior standing.

312—Advanced Playwriting (3). 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.

320—Theatre Practicum (1-3). Credit earned in advanced juried projects in acting, directing and theatrical design. Prerequisite: instructor's consent.

340—Summer Repertory Theatre (cr. arr.). Seminar, participation, laboratory in Summer Repertory Theatre. May be repeated. Prerequisite: instructor's consent.

341—Development of American Theatre I (3). Development of the American theatre from the beginning to 1915. Prerequisite: upperlevel or graduate standing.

342—Development of American Theatre II (3). Development of American theatre from 1915 to the present. Prerequisite: upperlevel or graduate standing.

343—Studies in Dramatic Theory (3). Analysis of history, meaning and function of selected concepts of contemporary dramatic and performance theory. Prerequisite: six hours of dramatic literature.

344—Studies in Dramatic Criticism (3). Survey of methods of criticism of scripts and performances. Prerequisite: six hours of dramatic literature.

347—Acting III (3). Acting styles, period, modern. Special projects in interpretation, rehearsal, creation of roles. Prerequisite: 244 or instructor's consent.

350—Directed Reading (1-3). Independent reading, reports. Prerequisite: instructor's consent.

351—Theatre Organization and Management (3). Practical and theoretical procedures of various types of theatre organization personnel, play selection, stage and house management, public relations, publicity, box office procedures, budgets and business practices.

352—Scene Design II (3). Theory and practice of scenic design for the theatre, with emphasis on the evolutionary process of design from concept to reality. Prerequisite: 254.

353—Advanced Theatrical Costume Design (3). Theory and practice of costume design for the theatre. Prerequisite: 251.

354—Stage Lighting Design (3). Theory and practice of lighting for theatre production. Prerequisite: 252.

362—Advanced Directing (3). Advanced principles of theatrical directing; emphasizes stylistic variations. May be repeated once. Prerequisite: 361.

363—Development of Dramatic Art I (3). Study of major dramas from the Greeks to 1875. Prerequisites: 60 and junior standing or instructor's consent.

364—Development of Dramatic Art II (3). Study of major dramas from 1875 to present. Prerequisites: 60 and junior standing or instructor's consent.

365—Theatre Architecture (3). Examines the renovation of existing buildings into workable theatre spaces. Includes history of theatre architecture. Prerequisite: six hours of upperlevel theatre courses.

367—Theatre History I (3). Development of theatre, dramatic literature from classical Greek to Restoration. Prerequisites: junior standing or instructor's consent.

368—Theatre History II (3). Major dramatic movements from Restoration to present. Prerequisites: junior standing or instructor's consent.

400—Problems (cr. arr.). Individual study or project not leading to thesis or dissertation. 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 (cr. arr.). Independent research of advanced nature leading to report. Prerequisite: instructor's consent.

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 in Theatre (cr. arr.). Research leading to thesis or dissertation. Prerequisite: instructor's consent.

Veterinary Biomedical Sciences

College of Veterinary Medicine
W116 Veterinary Medicine (314)882-7011

FACULTY

H. Richard Adams, chairman, professor, DVM, Texas A&M, PhD, University of Pittsburgh
Olen R. Brown, professor, PhD, University of Oklahoma
V. K. Ganjam, professor, DVM, S.V. University-India, PhD, Oklahoma State University
M. Harold Laughlin, professor, PhD, University of Iowa
Robert C. McClure, professor, DVM, Iowa State University, PhD, Cornell University
Vincent E. St. Omer, professor, DVM, University of Toronto, PhD, University of Guelph
Gheorghe M. Constantinescu, associate professor, DVM, PhD, University of Bucharest
Chada S. Reddy, associate professor, DVM, Andhra Pradesh Agricultural University, PhD, University of Mississippi
George E. Rottinghaus, associate professor, PhD, Iowa State University
John F. Amann, assistant professor, DVM, PhD, Cornell University
Calvin C. Hale, assistant professor, PhD, University of Texas-Austin
Eileen M. Hasser, assistant professor, PhD, University of Oklahoma
Leona J. Rubin, assistant professor, PhD, University of Colorado
James C. Schadt, assistant professor, PhD, Texas Tech University
Wade V. Welshons, assistant professor, PhD, Harvard University
Brian L. Frappier, instructor, DVM, Michigan State University, PhD, Ohio State University

JOINT APPOINTEES

Harold Garner, professor, DVM, Kansas State University, PhD, Baylor University
Ben Londeree, associate professor, EdD, University of Toledo
Gary Johnson, associate professor, DVM, University of Minnesota, PhD, Kansas State University

DEGREES: MS in veterinary anatomy, veterinary physiology and pharmacology, with emphasis in physiology; MS in veterinary physiology and pharmacology, with emphasis in pharmacology; MS in veterinary physiology and pharmacology, with emphasis in biochemistry and nutrition; PhD in physiology area; and PhD in anatomy or pharmacology in conjunction with the medical school

Programs of study are arranged individually. Prospective students are encouraged to correspond directly with the director of graduate studies about the available opportunities.

Admission is based in part upon evaluation of the applicant through correspondence and personal interview to determine the motivation and purpose of pursuing graduate degrees. Letters of reference should be submitted, as well as a transcript of previous courses of study and GRE general test scores.

MASTER'S DEGREE IN VETERINARY ANATOMY: The courses of study in veterinary anatomy include gross, microscopic and ultrastructural levels, comparative neuroanatomy and neurology, embryology and developmental anatomy and anatomy of laboratory animals.

The department has access to transmission and scanning electron microscopes. Electrophysiological monitoring and recording equipment, experimental surgery equipment and a giant microtome also are available. Supporting disciplines such as human anatomy, zoology, psychology and laboratory animal science are available on campus.

The requirements for a degree in the MS program depend upon whether the MS is a terminal degree or a step toward a PhD degree on this campus. All candidates are expected to demonstrate proficiency in neuroanatomy as well as in microscopic, developmental and gross anatomy. Continuation for the PhD degree requires statistics experience.

The student chooses an adviser and with an advisory committee plans the course of study consisting of a minimum of 30 hours beyond the baccalaureate degree. A thesis, based on original experimental laboratory investigation, and a final examination are required.

Work for the PhD degree can be accomplished through cooperation with the Department of Anatomy and the School of Medicine. The requirements for this program are described under Doctoral Degree for the Department of Anatomy.

MASTER'S DEGREE IN VETERINARY PHARMACOLOGY: Through this program graduate students gain a basis for understanding the fundamental principles of pharmacology and toxicology. Although planning a program is the responsibility of the student and adviser, the following courses (or their transferable equivalent) generally are necessary for the MS degree Statistics 207 (three hours); Pharmacology 320 (eight hours); Veterinary Anatomy-Physiology 326 or 427 (two to three hours) or 328 (three hours); Physiological Chemistry-Biochemistry 270, 272 and 274 or 304 and 305, or equivalent of these courses (six hours); Pharmacology 400-1evel courses in the area of the student's research interest (three to five hours); Pharmacology 410 (two hours); and Veterinary Biomedical Sciences 490 (eight to ten hours).

Students may choose to work on any of several different research projects, with instrumentation and laboratory space for investigations provided in the department. The main research areas are cardiovascular pharmacology and neuropharmacology. A thesis resulting from an original experimental laboratory investigation is required.

The PhD degree in pharmacology is granted in cooperation with the Department of Pharmacology in the School of Medicine. Candidates should inquire about the opportunities and requirements for such a program.

MASTER'S DEGREE IN VETERINARY PHYSIOLOGY: Graduate students in this section gain knowledge of normal functions in mammals and become familiar with research in the field.

The specific program of study for the MS degree depends on the background and interests of the student. Before enrolling for any course work, students should confer with their major professors. All programs generally include physiology (15 hours); physiological chemistry-biochemistry 270, 272, 274, or 304 and 305 or equivalent courses (six hours); and statistics (three hours).

The thesis is based on experimental physiological investigations conducted during the degree program. Because research interests and faculty change, prospective students are advised to explore any proposed programs.

DOCTORAL DEGREE: Graduate programs in the area of physiology are designed to provide in-depth training to meet the needs of the individual student. This program affords a unique opportunity to explore the relationships between several specialized fields of physiology.

The faculty includes members from the Department of Veterinary Biomedical Sciences (College of Veterinary Medicine) and joint appointees from the Department of Health and Physical Education (College of Education) and Veterinary Medicine and Surgery (College of Veterinary Medicine).

Specialties and interests include cardiac function and metabolism, systemic circulatory physiology, endocrinology, equine physiology, exercise physiology, neurologic control of the circulation, coronary dynamics, reproductive physiology, vascular smooth muscle function and metabolism, membrane cation transport proteins and steroid receptor functions.

Specialized major facilities in addition to departmental resources include the research reactor, Low-Level Radiation Laboratory and the Dalton Research Center. Extensive basic research laboratories and instrumentation are available in the faculty members' departments.

COURSES

200—Problems (cr. arr.). 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. Prerequisite: five hours of 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 (cr. arr.). Assignment of special problems or topics for training in research.
303—Cytology, Histology and Microscopic Anatomy of Domestic Animals (5). Detailed study of cytology, histology and microscopic anatomy, including an examination of organology of domestic animals through lecture and laboratory activities. Prerequisites: graduate standing, background in biological sciences, instructor's consent.
305—Histological and Anatomical Techniques (cr. arr.). Detailed study and practice of techniques used in preparation of specimens for microscopic and macroscopic study. Prerequisites: background in chemistry and anatomy, instructor's consent.
307—Embryology and Development of Domestic Animals (2). Developmental anatomy of domestic animals. Special written report 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 or review required. Prerequisites: background in biological science and 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 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). Physi-

ologic 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, four hours of vertebrate physiology or physiological zoology and five hours of chemistry, or instructor's consent.

328—Principles of Toxicology (3) (same as Pharmacology 328).

400—Problems (cr. arr.). Selected problems and topics for advanced study in special areas to meet needs of individual students.

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. Prerequisite: Biochemistry 272 (or equivalent) or instructor's consent.

409—Advanced Microscopic Anatomy (cr. arr.). Advanced microscopic study of selected topics in vertebrate microscopic anatomy. Special report required. Prerequisites: 303 or equivalent, graduate standing and 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.

418—Correlative Neuroanatomy (4). Comprehensive study of neuroanatomy of common domestic and laboratory animals. Prerequisite: graduate standing or instructor's consent.

420—Veterinary Physiology (5). Systematic physiology for graduate students with primary interest in animals other than man. Function of nerve, muscle, circulatory and respiratory systems. Prerequisites: Biochemistry 270 and 272.

421—Veterinary Physiology (5). Continuation of 420. Digestion, excretion, endocrinology, reproduction.

425—Microvascular Circulatory Function (3). 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 220 and 221 or Mammalian Physiology 305 or equivalent.

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 of physiology, five hours of pharmacology and five hours of biochemistry.

450—Research (cr. arr.). Open to graduate students with requisite preparation. Research not expected to terminate in thesis.

490—Research (cr. arr.). Open to graduate students with requisite preparation. Research expected to be presented as a thesis.

Veterinary Medicine and Surgery

College of Veterinary Medicine
107 Veterinary Teaching Hospital (314)882-7821

FACULTY

James E. Creed, chairman, professor, diplomate ACVS, DVM, University of Missouri-Columbia, MS, Colorado State University

V. K. Ganjam, director of graduate studies, professor, DVM, S.V. University, MS, Washington State University, PhD, Oklahoma State University

C. B. Chastain, professor, diplomate, ACVIM, DVM, University of Missouri-Columbia, MS, Iowa State University

Louis A. Corwin Jr., professor, diplomate, ACVR, DVM, PhD, Colorado State University

Harold E. Garner, professor, investigator, Dalton Research Center, diplomate, ACVIM, DVM, University of Missouri-Columbia, PhD, Drexel Institute of Technology

Allen W. Hahn, professor, investigator, Dalton Research Center, diplomate, ACVIM, DVM, University of Missouri-Columbia, PhD, Drexel Institute of Technology

Kenneth H. Niemeyer, professor, associate dean for academic and alumni affairs, DVM, MS, University of Missouri-Columbia

A. David Weaver, professor, member RCVS, Dr. Med. Vet., Hannover Veterinary College, PhD, Glasgow University

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Robert B. Miller, associate professor, diplomate, ABVP, DVM, Kansas State University, MS, PhD, University of Missouri-Columbia

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James Tomlinson, associate professor, diplomate, ACVS, DVM, University of Minnesota, MVetSci, University of Saskatchewan

B. Keith Collins, assistant professor, diplomate ACVO, DVM, University of Georgia, MS, University of Wisconsin

Ross P. Cowart, assistant professor, diplomate ABVP, DVM, University of Georgia, MS, University of Illinois

Marjorie E. Gross, assistant professor, DVM, Oklahoma State University, MS, University of Illinois

Fred Anthony Mann, assistant professor, diplomate ACVS, DVM, Ohio State University, MS, Texas A&M University

Dennis O'Brien, assistant professor, diplomate ACVIM, DVM, MS, PhD, University of Illinois

John T. Payne, assistant professor, DVM, The Ohio State University, MS, Virginia Polytechnic Institute and State University

Eric R. Pope, assistant professor, diplomate ACVS, DVM, MS, Auburn University

Laure Mills Wallace, assistant professor, diplomate ABVP, DVM, Kansas State University, MVSc, University of Saskatchewan

David A. Wilson, assistant professor, DVM, MS, University of Illinois

DEGREE: MS in veterinary medicine and surgery

The Department of Veterinary Medicine and Surgery offers graduate work leading to the master of science degree and supervision for postdoctoral study and research. The program provides advanced training in equine, food and companion animal medicine and surgery, comparative cardiology, neurology, ophthalmology, radiation biology, radiology and theriogenology.

Graduate students have ready access to clinical patients, medical records and facilities of the Veterinary Teaching Hospital to aid them in clinical research. The college has its own library.

Anyone desiring information about financial assistance, teaching/ research assistantships and fellowships should write, Department Chairman, Department of Veterinary Medicine and Surgery, College of Veterinary Medicine, 107 Veterinary Teaching Hospital, Columbia, Mo. 65211.

DEGREE REQUIREMENTS: The DVM degree or its equivalent, as approved by the department, is a prerequisite for advanced study. Performance in the professional curriculum greatly influences selection of applicants for graduate study. In addition, applicants must rank in the upper half of their respective graduating class and must take the GRE general test. The professional curriculum completed by the applicant is compared with that offered at MU. Applicants will be asked to strengthen any deficiencies, especially prerequisites to the chosen area of concentration.

Planning a program of study is the student's responsibility. The adviser assists the student with the program plan. There are many areas of specialization within the department and advantages of interchanges among them. An advisory committee should be selected within the first semester of study to provide guidance and approve a definitive program. Members of this committee (three or more) may be recommended later for appointment to the examining committee. The four- or five-member advisory group should consist of the major adviser and other member(s) of the department, a member from another department within the college and a member from outside the college. Members of the final examination committee should be chosen in the same manner as the advisory committee.

A thesis reporting results of original research is required of all candidates. An article based on research results also must be submitted to a refereed journal.

COURSES

300—Problems (cr. arr.). Studies in specific areas of veterinary medicine and surgery.

328—Introductory Radiation Biology (3) (same as Radiology 328, Nuclear Engineering 328 and Biological Sciences 328).

351—Advanced Surgical Techniques (cr. arr.). Special application to large, small animals. Prerequisite: DVM.

355—Advanced Techniques in Radiology (cr. arr.). Special application to domestic animals. Prerequisite: DVM.

400—Problems (cr. arr.). Advanced studies to meet needs of individual student.

401—Advanced Clinical Medicine (2). This is an advanced course for interns and residents, oriented more toward small animal medicine and surgery but occasionally dealing with other species such as equine and bovine.

410—Seminar (1). Discussion of current research.

450—Research (cr. arr.). Open to graduate students with requisite preparation.

487—Nuclear Medicine (3). Degrees equivalent to DVM acceptable. Principles of radiation detection instrumentation, monitoring radiological safety and diagnostic procedures used on veterinary nuclear medicine. Prerequisites: one year college physics, DVM 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 phys-

ics, DVM degree and departmental consent.
490—Research (cr. arr.). Open to graduate students with requisite preparation.

Veterinary Microbiology

College of Veterinary Medicine
104 Connaway Hall (314)882-6550

FACULTY

C. Andrew Carson, chairman, professor, PhD, University of Illinois, VMD, University of Pennsylvania
Hans K. Adldinger, director of graduate studies, professor, DVM, University of Munich, PhD, Cornell University
John N. Berg, professor, DVM, Iowa State University, PhD, University of Missouri-Columbia
Gerald M. Buening, professor, associate dean for research, DVM, PhD, Purdue University
Robert M. Corwin, professor, DVM, Michigan State University, PhD, University of Georgia
William F. Fales, professor, PhD, University of Idaho
Bruce D. Rosenquist, professor, DVM, Iowa State University, PhD, University of Missouri-Columbia
Robert F. Solorzano, professor, PhD, Pennsylvania State University
Theodore J. Green, associate professor, PhD, The Ohio State University
James G. Thorne, associate professor, DVM, University of Missouri-Columbia, PhD, University of Georgia
Gary K. Allen, assistant professor, DVM, Mississippi State University, PhD, University of Missouri-Columbia
Bimal K. Ray, assistant professor, PhD, Calcutta University

DEGREES: MS in veterinary microbiology and PhD in microbiology area

The MS and PhD programs are designed to prepare students for teaching, research and diagnostic service in veterinary microbiology, infectious diseases and the biomedical areas.

As a specialized segment of microbiology, veterinary microbiology involves studies of the host-parasite relationship. Studies of infectious disease, host resistance, immunology and preventive medicine are emphasized. Graduate programs include courses in biochemistry, genetics, immunology, pathology, physiology, radiobiology, statistics and ultrastructural morphology, as well as bacteriology, mycology, parasitology and virology. Specific areas of concentration are bacteriology, epidemiology, immunology, mycology, parasitology, veterinary community health and virology.

Research and teaching laboratories and other departmental facilities are in Connaway Hall. Facilities for animal care are in Connaway Hall and the Veterinary Medicine Research Farm on Brown Station Road, four miles north of the campus. Additional animal facilities are available at other locations.

A limited number of stipends are available from research grants. Other sources of support include National Institutes of Health postdoctoral and special fellowships, other fellowships and assistantships funded by the federal or state government and stipends from commercial companies. Students provide their own support from private, commercial and governmental sources.

MASTER'S DEGREE: The following are requirements for admission:

- a professional degree or a baccalaureate degree in a biological or physical science
- rank in the upper one-half of the graduating class
- a minimum GPA of 3.0 (A=4.0) on the last 60 hours of undergraduate curriculum. Students with a cumulative GPA below 3.0 may be admitted based upon superior test scores, work experience and outstanding recommendations.
- the approval of the adviser, the department chairman and the director of graduate studies
- a combined score on the verbal and quantitative portions of the GRE general test of at least 1,000. This test is required.

In exceptional cases, students who do not meet the established requirements may be accepted for a one-semester probationary period during which they must attain at least a B average to continue graduate study.

Under the guidance of an adviser, a program of study is designed to fit the student's academic background, experience and objectives. The course of study must include a minimum of nine credit hours outside the department, including one course in biochemistry or biostatistics (300 or 400 level). This latter requirement may be waived for students who present evidence of satisfactory completion of equivalent courses from another institution.

Upon satisfactory completion of the course work and thesis, the Graduate School appoints a final examination committee composed of at least one member from the area of microbiology and one member from outside the department.

DOCTORAL DEGREE: To be accepted for advisement in the area program, a student should have completed mathematics through college algebra, 10 hours of chemistry including organic, 10 hours of biology and 5 hours of physics.

The master's degree or a professional college degree (MD or DVM) may be accepted as meeting requirements for admission in lieu of the minimal GPA stipulated under Regulations for Admission, providing 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.

To be considered for candidacy, an applicant must pass a qualifying examination administered by the Doctoral Program Committee. This program normally requires three years beyond the master's degree. It consists of a course of study, practical experience in teaching and research, a comprehensive examination and demonstration of research and writing ability by completing a doctoral dissertation on an approved problem.

The majority of the student's program and examining committees shall be from the area faculty. Under theguidance 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 and advanced microbiology. Courses may be chosen from one or more departments, as determined by the program committee, but shall constitute a definite plan of education for research or scholarly investigation in some particular aspect of microbiology.

The final examination covers chiefly the dissertation.

COURSES

210—Parasitology (4).
248—Veterinary Meat Hygiene, Zoonosis and Preventive Medicine (2).
300—Problems (cr. arr.).
343—Animal Virology (4). Lectures and laboratories on properties, host cell and disease relationships of animal viruses and on methods for their detection and study. Prerequisites: general microbiology and general biochemistry.
345—Veterinary and Human Parasitology (4). Protozoa and helminths of veterinary and human importance; three one-hour lectures, one two-hour lab each week. Advanced undergraduate or graduate standing in biological, veterinary or medical sciences. Prerequisites: Biological Sciences 210 or equivalent and instructor's consent.
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.
348—Epidemiology of Zoonotic Diseases (1-10). Zoonotic diseases of major public health importance in North America. Includes epidemiology and transmission of these diseases, with particular emphasis on control/ eradication methods. Prerequisite: enrollment in a professional medical, dental or public health curriculum.
410—Seminar (1). Open to graduate students in veterinary microbiology and allied biological sciences. Study and discussion of current knowledge and research in microbiology, infectious diseases and epidemiology.
421—Advanced Epidemiology (3) (same as Family and Community Medicine 421).
441—Topics in Veterinary Microbiology (1-3). Subjects appropriate to veterinary microbiology or epidemiology, taught on a one-time basis or infrequently. May include highly specialized topics. Specific course must be approved by departmental faculty. Prerequisites: graduate standing and instructor's consent.
442—Advanced Veterinary Pathogenic Bacteriology (3). Study of pathogenic bacteria causing animal disease. 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.
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.
444—Diseases of Laboratory Animals (3) (same as Laboratory Animal Medicine Area 444). Identification and characterization of diseases of commonly used laboratory animals excluding primates.
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.
446—Cellular Function in Immunity (2). Study of the immune system at the level of the intact animal. Includes a discussion of immunity-infectious diseases. Prerequisites: Microbiology 304, graduate standing and instructors consent.
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.
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 such as analysis and manipulation of nucleic acids and their application to define structure, function and biosynthesis of macromolecules. Prerequisite: instructor's consent.
449—Epidemiology of Zoonoses (3) (same as Family and Community Medicine 449). Detailed study of epidemiology and ecology of zoonotic diseases including control and

prevention. Prerequisites: epidemiology and medical microbiology or instructor's consent.

490—Research (cr. arr.). Nutrition, metabolism and pathogenicity of microorganisms; host resistance mechanisms, epidemiology or preventive medicine.

Veterinary Pathology

College of Veterinary Medicine
W213 Veterinary Medicine (314)882-6647

FACULTY

Joseph E. Wagner, chairman, professor, DVM, Iowa State University, PhD, University of Illinois

Gary S. Johnson, director of graduate studies, associate professor, DVM, Kansas State University, PhD, University of Minnesota

Harvey Gosser, professor, director, veterinary medical diagnostic laboratory, DVM, Auburn University, PhD, University of Missouri-Columbia

LeRoy D. Olson, professor, DVM, PhD, Purdue University

Donald A. Schmidt, professor, DVM, PhD, Michigan State University

Linda L. Collier, associate professor, DVM, Cornell University, PhD, Washington State University

Reuel R. Hook Jr., associate professor, PhD, West Virginia State University

Darrell A. Kinden, associate professor, PhD, University of Missouri-Columbia

Margaret A. Miller, associate professor, DVM, University of Missouri-Columbia, PhD, Washington State University

Robert B. Miller, associate professor, DVM, PhD, University of Missouri-Columbia

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-Chapel Hill

James R. Turk, associate professor, DVM, University of Missouri-Columbia, PhD, Washington State University

Cynthia Besch-Williford, assistant professor, DVM, Louisiana State University, PhD, University of Missouri-Columbia

Stan Casteel, assistant professor, DVM, University of Missouri-Columbia, PhD, Texas A&M University

Gayle C. Johnson, assistant professor, DVM, University of California-Davis, PhD, Washington State University

John M. Kreeger, assistant professor, DVM, PhD, Louisiana State University

Lanny Pace, assistant professor, DVM, Mississippi State University, PhD, Louisiana State University

Lela K. Riley, assistant professor, PhD, University of Kansas-Lawrence

Earl K. Steffen, research assistant professor, PhD, University of Missouri-Columbia

DEGREE: MS in veterinary pathology

INTERDISCIPLINARY AREA PROGRAMS: PhD in pathology and MS in laboratory animal medicine

The Department of Veterinary Pathology offers graduate work leading to the master of science in veterinary pathology and also cooperates with the Department of Pathology in the School of Medicine and the Department of Plant Pathology in the College of Agriculture, Food and Natural Resources in offering a PhD degree in the pathology area program.

The laboratories and equipment described in the Pathology Area Program generally are available for MS candidates. The areas' fields of study are applicable to the departmental program.

MASTER'S DEGREE: The following areas of concentration are offered in the veterinary pathology department: anatomic pathology, toxicological pathology, clinical pathology and laboratory animal medicine. Stipends are available from NIH and university funds.

For admission to the master of science program in veterinary pathology, the applicant should have completed the DVM or an acceptable baccalaureate degree. The latter would include subject courses in anatomy, microbiology, physiology, biochemistry and pathology, or their equivalents. Students who are not in the upper one-third of their graduating classes may be admitted on probationary status for one semester. The GRE general test must be taken either before entering Graduate School or during the first semester.

An advisory committee of three faculty members is established during the first semester to assist in formulating a study plan and to advise the student on thesis research.

A student must complete a minimum of 30 graduate credit hours. An acceptable thesis, or a paper acceptable for publication in a major journal, and a final examination, chiefly in defense of the thesis, are required of all MS degree candidates. It is possible for a student to transfer to the PhD program without completing the MS degree requirements. ***For information write Director of Graduate Studies, Department of Veterinary Pathology, College of Veterinary Medicine, W213 Veterinary Medicine Complex, Columbia, Mo. 65211.***

COURSES

200—Problems (cr. arr.). Assignment of special topics for research training in veterinary pathology.

230—Animal Sanitation and Disease Prevention (3). Preventative measures for diseases and parasites of farm animals. Prerequisites: Veterinary Anatomy-Physiology 219 or 222.

300—Problems (cr. arr.). Prerequisites: DVM and departmental consent.

356—Advanced Studies of Poisonous Plants and Toxicity (cr.arr.). Course covers organ systems affected, toxic principles, mechanisms of action and conditions leading to intoxication of mammals by poisonous plants. Prerequisite: DVM or instructor's consent.

401—Topics (cr. arr.). Courses with lectures in various topics in veterinary pathology will be given on a trial basis, depending on faculty expertise and student demand.

410—Seminar (1). Discussion of current research methods in veterinary pathology and AFIP case studies.

431—Advanced Veterinary Pathology (1-5). Study of diseases of domestic animals at macroscopic and microscopic levels. Optional necropsy. Prerequisites: 263 or equivalent, graduate standing and instructor's consent.

432—Advanced Histopathology (1-5). Typical lesions of common diseases of domestic animals are examined histologically. Students must describe these lesions using the ACVP format and assign morphologic and etiologic diagnoses. Prerequisite: instructor's consent.

433—Veterinary Oncology (1-5). Literature review of the molecular biology of neoplastic cells and practical application of diagnostic histopathology. 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 analysis.

437—Pathology of Laboratory Animals (4) (same as Laboratory Animal Medicine 437). Gross and microscopic study of spontaneous and naturally occurring diseases in laboratory animals. Prerequisite: departmental consent.

450—Non-Thesis Research (cr.arr.). Research not expected to terminate in dissertation.

452—Transmission Electron Microscopy (3) (same as Plant Pathology 452). Provides extensive exposure to principles of TEM, instrumentation and techniques employed in biological research. Prerequisites: graduate standing and instructor's consent.

453—Scanning Electron Microscopy (3) (same as Plant Pathology 453). Provides basic principles and extensive exposure to instrumentation and procedure for scanning microscopy of biological materials. Prerequisites: graduate standing and instructor's consent.

490—Thesis Research (cr.arr.). Independent investigation in field of veterinary pathology to be presented as a thesis.

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