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GRADUATE SCHOOL BULLETIN

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VOLUME

BULLETIN OF THE
UNIVERSITY OF KENTUCKY

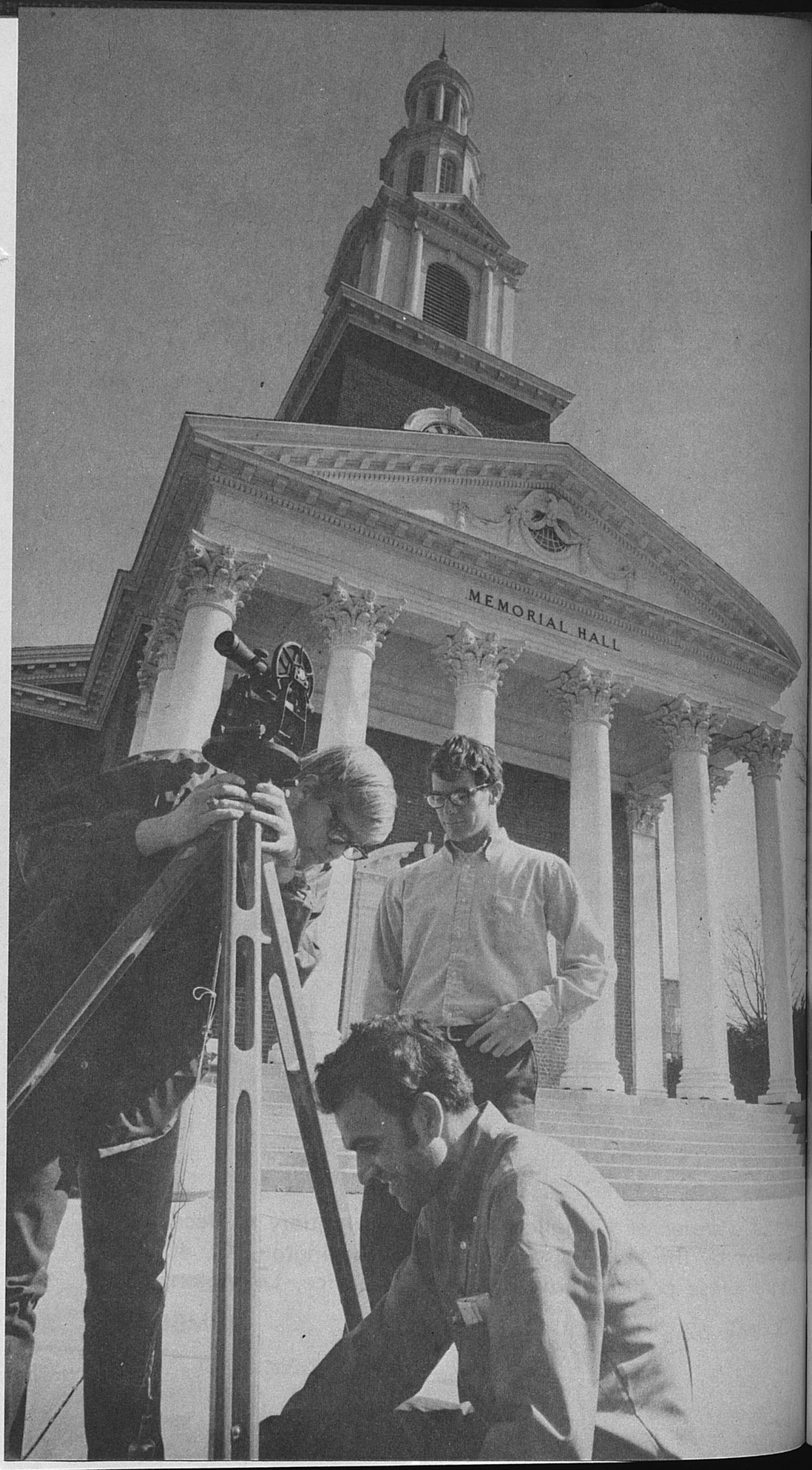
JULY, 1970

Graduate School

1970-71

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VOLUME 62 JULY, 1970 NUMBER 7


MEMORIAL HALL

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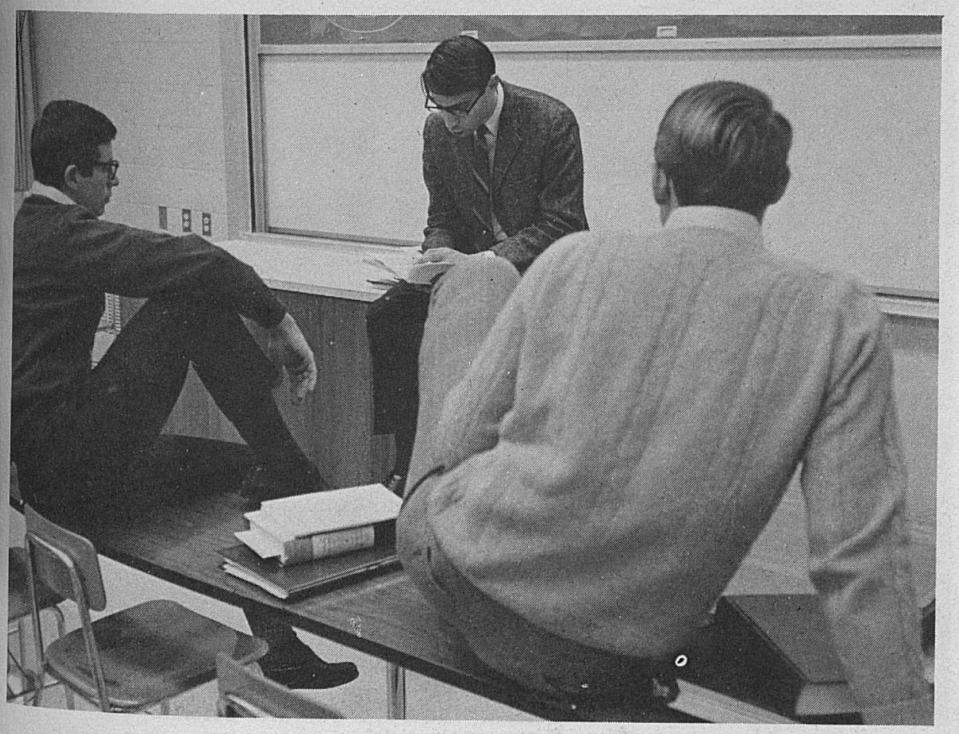
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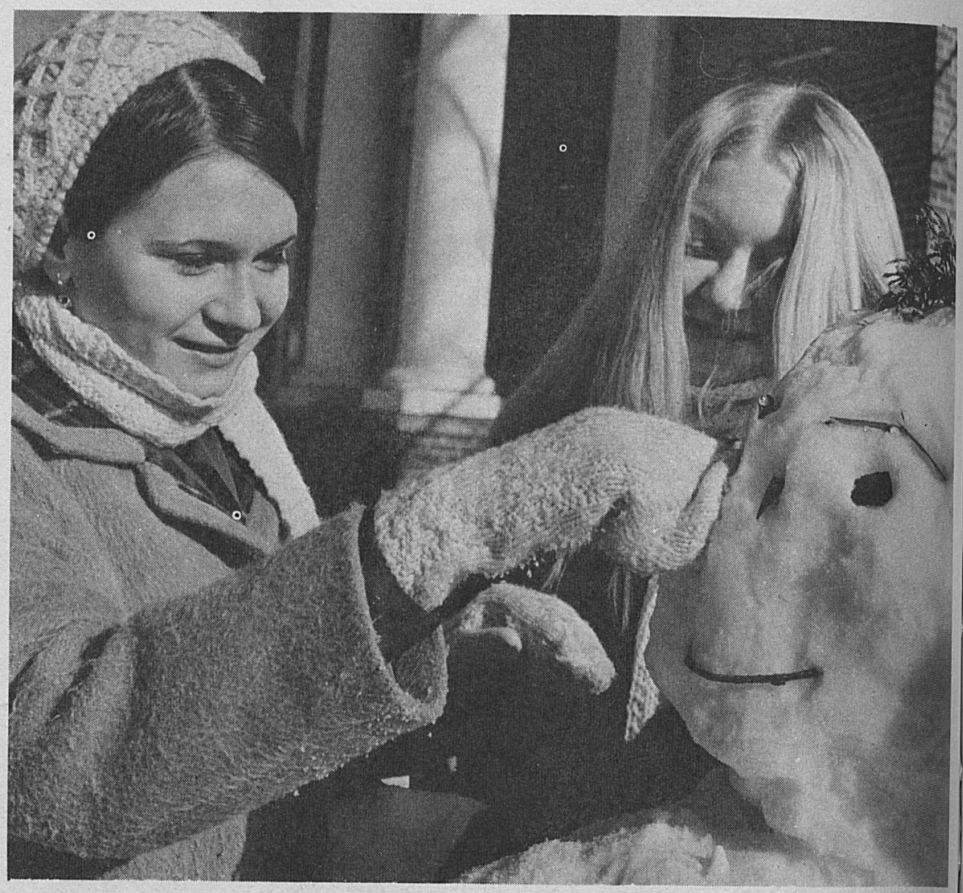
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University Calendar—1970-71

1970	*Fall Semester*
July 29	Wednesday—Last day to submit all required documents to ~~Registrar's Office~~ Graduate Admissions Office for admission to the 1970 Fall Semester
Aug. 31-Sept. 1	Monday and Tuesday—Classification, registration, and orientation for students not pre-registered
Sept. 2	Wednesday—Classwork begins
Sept. 7	Monday—Labor Day—Academic Holiday
Sept. 8	Tuesday—Last day to enter an organized class for the Fall Semester
Sept. 14	Monday—Last day to drop a course without a grade
Sept. 15, 16	Tuesday and Wednesday—Last days for filing application for a December degree in College Dean's Office. Graduation fees to be paid by November 2
Nov. 10	Tuesday—Last day to withdraw from a class before finals
Nov. 26-28	Thursday, Friday, Saturday—Thanksgiving Holidays—Academic Holidays
Dec. 7	Monday—Thesis Deadline
Dec. 11	Friday—Last day to submit all required documents to ~~Registrar's Office~~ Graduate Admissions Office for admission to the 1971 Spring Semester
Dec. 15	Tuesday—Classwork ends
Dec. 17-23	Thursday through Wednesday—Final examinations
Dec. 23	Wednesday—End of Fall Semester
Dec. 28	Monday—All grades due in Registrar's Office by 4:00 p.m.



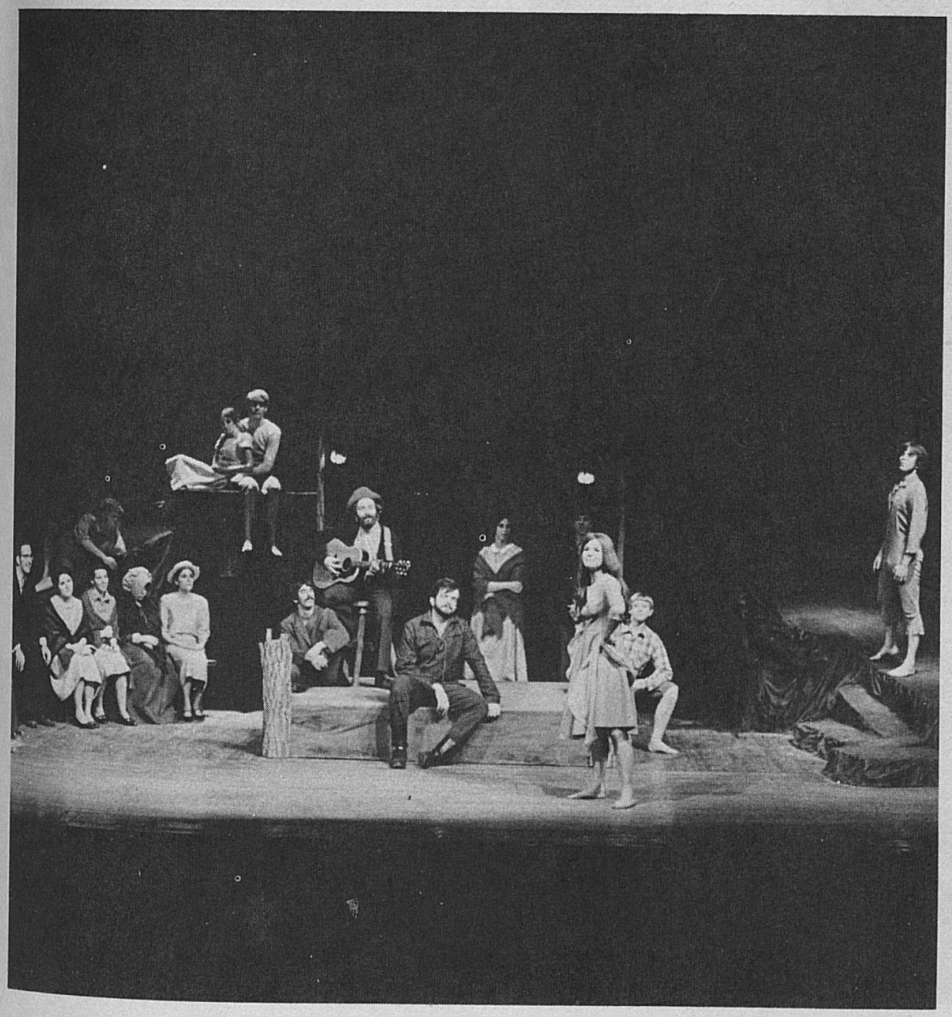


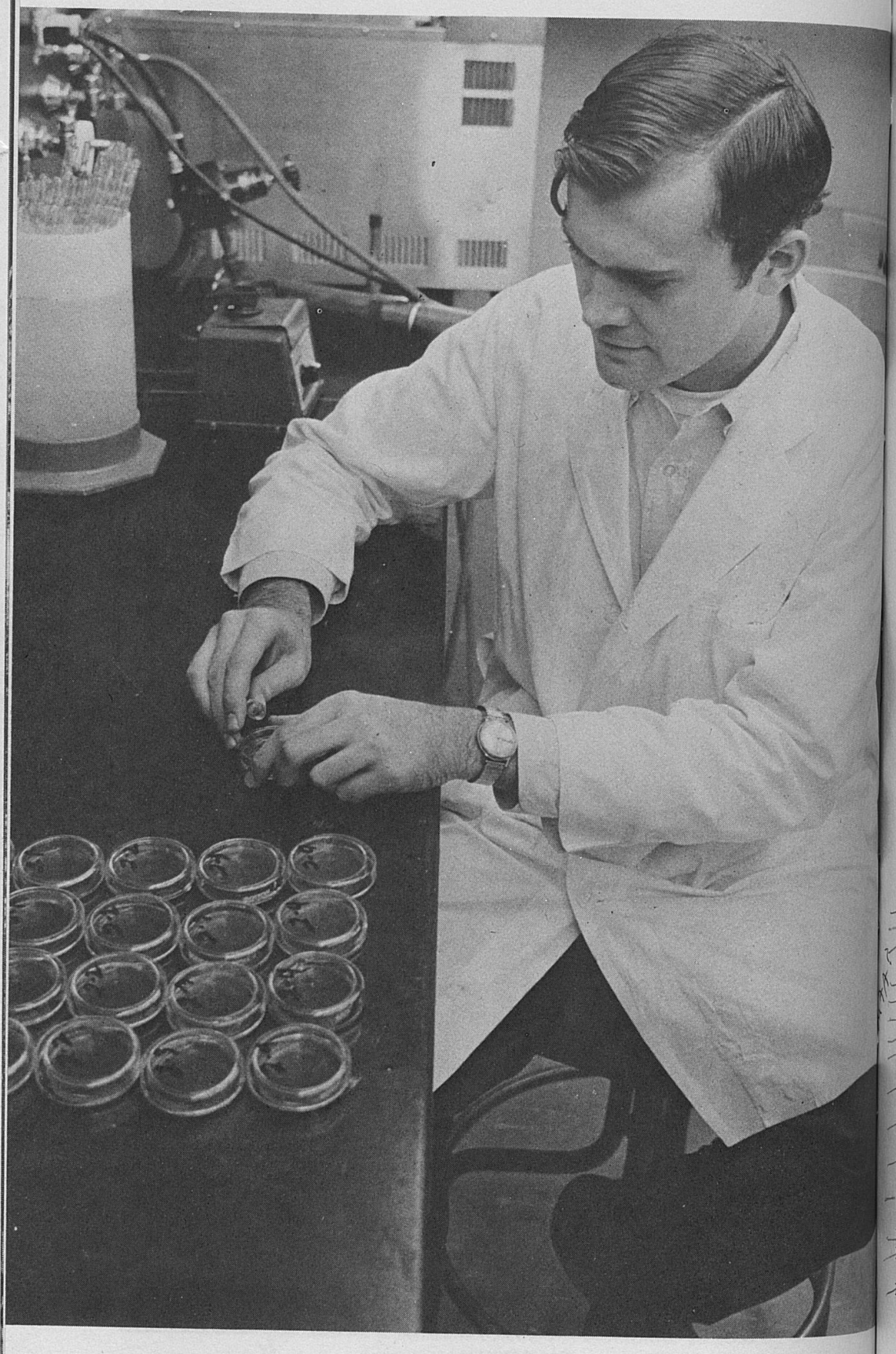
1971 *Spring Semester*

Jan. 11, 12	Monday and Tuesday—Classification, registration and orientation for students not pre-registered
Jan. 13	Wednesday—Classwork begins
Jan. 19	Tuesday—Last day to enter an organized class for the Spring Semester
Jan. 25	Monday—Last day to drop a course without a grade
Jan. 25, 26	Monday and Tuesday—Last days for filing application for a May degree in College Dean's Office. Graduation fees to be paid by March 12
March 13-21	Saturday through Sunday—Spring vacation
March 29	Monday—Last day to withdraw from a class before finals
April 16	Friday—Thesis Deadline
May 1	Saturday—End of classwork
May 3-8	Monday through Saturday—Final examinations
May 8	Saturday—End of Spring Semester
May 9	Sunday—Baccalaureate-Vesper Services
May 10	Monday—104th Annual Commencement
May 12	Wednesday—All grades due in Registrar's Office by 4:00 p.m.
May 17	Monday—Last day to submit all required documents to ~~Registrar's Office~~ Graduate Admissions Office for admission to the 1971 Summer Session

1971 *Summer Session*

June 14, 15	Monday and Tuesday—Registration
June 16	Wednesday—Classwork begins
June 21	Monday—Last day to enter an organized class for the Summer Session
June 28	Monday—Last day to drop a course without a grade
June 28, 29	Monday and Tuesday—Last day for filing application for an August degree in College Dean's Office. Graduation fees to be paid by July 16
July 5	Monday—Independence Day Academic Holiday
July 22	Thursday—Thesis Deadline
July 28	Wednesday—Last day to withdraw from a class before end of Summer Session
July 30	Monday—Last day to submit all required documents to ~~Registrar's Office~~ Graduate Admission Office for admission to the 1971 Fall Semester
August 11	Wednesday—End of 1971 Summer Session
August 13	Friday—All grades due in Registrar's Office by 4:00 p.m.





The Graduate School

LEWIS W. COCHRAN, M.S., Ph.D., Dean
JAMES C. HUMPHRIES, M.S., PH.D., Assistant Dean
CARL CABE, Ph.D., Assistant Dean
DOROTHY C. LINVILLE, A.B., Admissions Officer
LUCY ROBERTA HOGAN, A.B., Administrative Assistant
ROSA LENA BRUMFIELD, B.S. in Com., Administrative Secretary

Introductory Statement

THE UNIVERSITY OF KENTUCKY began offering graduate work in 1870 and awarding graduate degrees in 1876. The Graduate School as a distinct unit was not organized until 1912.

The Graduate School is concerned with advanced study and research carried on by the faculty and students of all colleges and departments. Under it the total graduate resources of the University are merged in order to promote the achievement of knowledge in an atmosphere of free and lively inquiry.

Graduate work is offered in all colleges in the University. Directors of graduate study in the various subjects are listed in this bulletin just before the list of courses, pages

The following advanced degrees are conferred:

- MASTER OF ARTS
- MASTER OF ARTS IN EDUCATION
- MASTER OF BUSINESS ADMINISTRATION
- MASTER OF MUSIC
- MASTER OF SCIENCE
- MASTER OF SCIENCE IN ACCOUNTING
- MASTER OF SCIENCE IN AGRICULTURE
- MASTER OF SCIENCE IN AGRICULTURAL ENGINEERING
- MASTER OF SCIENCE IN CHEMICAL ENGINEERING
- MASTER OF SCIENCE IN CIVIL ENGINEERING
- MASTER OF SCIENCE IN CLINICAL NUTRITION
- MASTER OF SCIENCE IN DENTISTRY WITH SPECIALTY IN ORTHODONTICS
- MASTER OF SCIENCE IN EDUCATION
- MASTER OF SCIENCE IN ELECTRICAL ENGINEERING
- MASTER OF SCIENCE IN ENGINEERING MECHANICS
- MASTER OF SCIENCE IN HOME ECONOMICS
- MASTER OF SCIENCE IN LIBRARY SCIENCE
- MASTER OF SCIENCE IN MECHANICAL ENGINEERING
- MASTER OF SCIENCE IN MEDICAL RADIATION
- MASTER OF SCIENCE IN METALLURGICAL ENGINEERING
- MASTER OF SCIENCE IN NUCLEAR ENGINEERING
- MASTER OF SCIENCE IN NURSING
- MASTER OF SCIENCE IN RADIOLOGICAL HEALTH
- MASTER OF SOCIAL WORK
- MASTER OF SCIENCE IN STATISTICS
- SPECIALIST IN EDUCATION
- DOCTOR OF BUSINESS ADMINISTRATION (D.B.A.)
- DOCTOR OF EDUCATION (Ed.D.)
- DOCTOR OF MUSICAL ARTS IN MUSIC TEACHING (D.M.A.)
- DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy is offered with major work in the following fields: Agricultural Economics, Agricultural Engineering, Anatomy, Animal Sciences, Anthropology, Biology, Biochemistry, Chemical Engineering, Chemical Physics, Chemistry, Civil Engineering, ~~Diplomacy and International Commerce,~~ Economics, ~~Education,~~ Electrical Engineering, Engineering Mechanics, English, Entomology, French, Geography, Geology, Germanic Languages, History, Mathematics, Mechanical Engineering, Metallurgical Engineering and Materials Science, Microbiology, Pharmaceutical Sciences, Pharmacology, Physics, Physiology and Biophysics, Plant Pathology, Plant Physiology, Political Science, Psychology, Sociology, Soil Science, Spanish, Statistics, Toxicology, and Veterinary Science. Minor work may be carried in any department offering graduate courses.

Organization of the Graduate School

THE GRADUATE FACULTY consists of the Dean of the Graduate School and all persons appointed thereto by the President of the University in the manner set forth below. As the chief University agency for the promotion of the ideals of graduate study, it determines the policies of the Graduate School and makes recommendations to the University Senate on such matters as require the approval of that body, and it may make recommendations on other matters to the President, or to other administrative officials. All rules affecting graduate work and the inauguration of new graduate majors must be approved by the Graduate Faculty.

Any proposed change in the rules of the Graduate School must be included in the agenda of the meeting and circulated to the Graduate Faculty at least 10 days prior to the meeting at which it is to be considered.

New Graduate Faculty members may be proposed to the Dean of the Graduate School at any time by the college deans and department chairmen concerned, or in the case of persons not attached to a college faculty, by the ~~Executive~~ Vice-President of the University. Eligibility qualifications are as follows:

1. The doctor's degree or its equivalent in scholarly reputation.
2. The rank of assistant professor (or equivalent), or higher.
3. Scholarly maturity and professional productivity as demonstrated by publications, editorial services, research surveys, creative work, or patents; and research in progress at the time of ~~proposal~~.
4. Definite interest in graduate work and the willingness to participate in the graduate program.

Appointment to the Graduate Faculty is made by the President of the University on nomination by the Dean of the Graduate School after he and the Graduate Council have studied the credentials submitted in support of the proposed members.

Associate members are appointed by the Dean of the Graduate School upon nomination by the Director of Graduate Study. Associate membership is limited to non-tenured Assistant Professors who hold the doctorate, have been full-time members of the faculty for at least one year, and have initiated a significant research effort. This membership may continue no more than five years. Associate members are authorized to teach graduate courses, direct masters' theses, serve on and co-chair doctoral committees, and attend and participate in Graduate Faculty meetings. They do not have voting privileges in the Graduate Faculty.

Administrative officers assigning teaching and other duties to members of the Graduate Faculty who are taking an active part in the graduate program (i.e., are heavily engaged in directing theses, carrying on productive research, etc.) should make appropriate reduction in the duties required of such teachers.

THE DEAN AND HIS OFFICE. The Dean of the Graduate School is charged with the administration of the policies adopted by the Graduate Faculty and the University Senate relating to graduate studies. He presides over all meetings of the Graduate Faculty and calls meetings of this faculty whenever he thinks it advisable or whenever requested to do so by one fourth of the membership. He makes recommendations to the Graduate Faculty respecting the requirements for advanced degrees, the regulations necessary to insure a high standard of graduate work, the departments of colleges authorized to offer courses leading to graduate degrees, and all other aspects of the graduate program. He appoints a committee for each graduate student, arranges for final examinations, advises students with regard to their studies and the requirements of the Graduate School, and in all other ways administers the graduate program in the interests of efficient instruction and the highest attainment possible on the part of each graduate student. He is responsible for determining and certifying to the Registrar candidates who have fulfilled requirements for advanced degrees.

The President and the Dean of the Graduate School are members ex-officio of all committees of the Graduate Faculty.

THE GRADUATE COUNCIL is composed of 11 members and the Dean of the Graduate School, who is chairman. There are eight elected representatives and three members appointed by the Dean of the Graduate School. One of the elected members is from the College of Agriculture, two from the College of Arts and Sciences, one from the

College of Business and Economics, two from the College of Education, one from the College of Engineering, and one from the College of Medicine. The member or members from each of these colleges are elected by the Graduate Faculty members in that college. The term of office of the elected and appointed members is three years, and no member may succeed himself until three years have elapsed since the completion of his last term.

The Graduate Council approves or disapproves proposals concerning courses offered for graduate credit, and advises and lends assistance to the Dean in his execution of policies and regulations determined by the Graduate Faculty. Specifically, the Council

1. Studies requests of departments relating to proposed graduate programs.
2. Reviews existing programs and courses.
3. In cooperation with the Dean, initiates recommendations to the Graduate Faculty. (This procedure is not intended to prevent a faculty member from bringing any recommendation or request directly before the Graduate Faculty.)

The Graduate Council has such authority as is herein granted, or such as the Dean or the Graduate Faculty may delegate to it. A majority of the Graduate Council constitutes a quorum for the transaction of business.

Directors of Graduate Study. A director of graduate study serves as adviser to each student majoring in his area until the student has a thesis director. The director of graduate study then recommends that this thesis director be appointed the student's adviser or committee chairman. In areas where theses are not required, the director of graduate study is the adviser for all students not writing theses. All student classification schedules must be endorsed by the student's adviser.

If it is desirable, a director of graduate study may recommend that additional advisers in the area be appointed. A director of graduate study who is to be absent from the University for as long as a semester must call this fact to the attention of the Dean so that a substitute may be appointed.

The Dean of the Graduate School, with the advice of the college dean(s) and the approval of the President, may recommend to the Graduate Faculty the areas of graduate study and research into which the University may be divided. (The logical unit for an area is a department. By common consent, however, certain departments may be grouped into an area; and in exceptional cases a department may be divided into two or more areas.) The Directors of Graduate Study for the various areas are appointed by the Dean of the Graduate School.

ESTABLISHMENT AND MODIFICATION OF GRADUATE PROGRAMS. An area which wishes to establish a new graduate program or modify an existing one must submit its program to the Graduate Council, which will make recommendations concerning it to the Graduate Faculty.

HONORARY DEGREES. The selection of candidates for honorary degrees originates in the Graduate Faculty, and the Graduate Faculty makes its recommendations to the University Senate.

Honorary degrees are normally conferred at the May Commencement, but may be conferred at other times with the approval of the Graduate Faculty. Recipients must be present in order to receive honorary degrees.

Admission

A student who is a graduate of a fully accredited institution of higher learning and has an undergraduate grade-point standing on all work attempted of at least 2.5 on a basis of 4.0 may apply for admission to the Graduate School by submitting to the Graduate Admissions Office two official transcripts of all college courses and a written application at least a month before anticipated entrance. Application blanks may be obtained from the Admissions Office of the Graduate School. A student with a grade-point average of less than 2.5, or a graduate of a non-accredited institution, may be admitted only after the Graduate Record Examination or other evidence acceptable to the Dean of the Graduate School, and to the Department, indicate that he is capable of doing satisfactory graduate work. Individual departments may establish higher requirements.

It should be clearly understood that a graduate student may not be able to begin immediately a full graduate program leading to the degree he desires; it may be necessary for him to satisfy prerequisites which he omitted in his undergraduate curriculum. Deficiencies are determined by the department in which the major work is to be done. Ordinarily, a graduate student may begin a full program in any field in which he has a balanced undergraduate major or its equivalent.

Admission to the Graduate School entitles a student to take such courses as he desires, provided he has the necessary prerequisites. *However, admission does not automatically make a student a candidate for a graduate degree.*

Attendance in the Graduate School at the University of Kentucky is not a right. It is a privilege which may be withdrawn by the University or any area of graduate study if it is deemed necessary by the Dean of the Graduate School in order to safeguard the University's standards.

GRADUATING SENIORS AS PART-TIME GRADUATE STUDENTS

A senior in the University of Kentucky lacking no more than six credit hours for graduation and having an undergraduate average of at least 2.5 on all work attempted may register in the Graduate School with the consent of his college dean and the Dean of the Graduate School. Approval of the appropriate director of graduate study is required if the student is to be an applicant for a degree. The total load of such a student may not exceed 12 credit hours. Graduate credit will be allowed for each credit hour of graduate work beyond the six or fewer credit hours needed to complete undergraduate requirements. The incidental fee is that of a full-time student in the school in which more than half of the work is taken. In cases where the load is evenly divided between the schools, the larger fee is assessed. Requirements for the undergraduate degree must be completed during the semester in which the student is allowed to register for part-time graduate work. Students desiring to enroll in the Graduate School under these conditions must fill out in duplicate a petition listing the course or courses to be taken in order to complete their undergraduate requirements. The petition must be approved by both deans concerned.

ADVANCED DEGREES FOR FACULTY MEMBERS

Members of the faculty of the University of Kentucky having a rank higher than that of instructor may not be considered as candidates for advanced degrees from this institution. They may take graduate courses, but these may not apply toward a degree from the University.

STUDENT RESPONSIBILITY

It is the responsibility of the student to inform himself concerning, and to observe all regulations and procedures required by the course he is pursuing. *In no case will a regulation be waived or an exception granted because a student pleads ignorance* of the regulation or asserts that he was not informed of it by his adviser or other authority. Therefore, the student should become familiar with the *Graduate School Bulletin*, including (1) the section presenting the requirements for the degree which he plans to take, and (2) the offerings and requirements of his major department.

The student should consult the Director of Graduate Studies of the department in which he will do his work concerning course requirements, any deficiencies, the planning of a program, and special regulations. Departments may have degree requirements that are not listed in the *Bulletin*.

It is to be noted that the Graduate Dean interprets the *Graduate*



Bulletin; any other interpretations are unofficial. Only the Graduate Council may waive requirements stated in this Bulletin.

General Requirements for All Advanced Degrees

REGISTRATION AND CLASSIFICATION

All students expecting graduate credit must be enrolled in the Graduate School. Graduate students will conform to the general registration schedule of the University and may not enter later than the last allowable date set by the Registrar.

Before registering, a graduate student must obtain his adviser's approval of his proposed program.

THE GRADUATE RECORD EXAMINATION

All students working for graduate degrees must take the Aptitude Test and the Advanced Test of the Graduate Record Examination. This must be done no later than the first term of graduate work.

The College of Business and Economics may substitute the Admission Test for Graduate Study in Business (ATGSB) for the Graduate Record Examination, ~~Aptitude and Advanced Tests~~, for MBA, DBA and Accounting students.

APPLICATION FOR FULL GRADUATE STANDING

A graduate student desiring to earn a graduate degree must be approved for full graduate standing by the Director of Graduate Study in the area in which he intends to major and by the Graduate School. Application should be made as soon as scores on the Graduate Record Examination are available, and in any case prior to the beginning of the semester or term in which the degree is sought.

To be admitted to full graduate standing, a student must have scores on the Graduate Record Examination satisfactory to the department concerned and to the Dean of the Graduate School, and a *B* average or higher on all graduate work attempted at the University of Kentucky.

Graduate work taken before a student is admitted to full graduate standing will be evaluated by the Director of Graduate Study in the major area and by the Dean of the Graduate School at the time the application for full graduate standing is considered.

GRADUATE COURSES; GRADE AVERAGE

All courses numbered 500 through 799 may be counted for credit toward a graduate degree provided they are approved as an appropriate part of the student's graduate program by his graduate adviser or committee. Courses numbered 400 to 499 carry graduate credit for nonmajors only. An over-all average of *B* on all work taken as a graduate student, as well as a *B* average on all work carrying graduate credit, must be attained before an advanced degree may be awarded. All work is to be counted and none of it may be omitted in computing the average. However, those grades in courses which do not give graduate credit may be omitted from a student's average by the Dean of the Graduate School on recommendation of the student's adviser. *D* grades are not given to graduate students. An "incomplete" (*I*), unless the Dean of the Graduate School grants an extension of time, must be removed within one calendar year after the close of the term in which the *I* is assigned if the student is to receive credit.

Courses numbered at the 600 or 700 level shall be taught only by members of the Graduate Faculty or by such other instructors as are approved by the Graduate Dean.

DROPPING OF COURSES

During the first 10 class days of the term a graduate student may drop a regular course without a grade, provided he has the approval of his instructor, his director of graduate study, and the Dean. Regular courses may not be dropped later in the term without the assignment

of a grade: *W* if a student withdraws passing, *E* if he is failing. However, only under very special circumstances may he be allowed to withdraw from a class within five weeks of the final examination period.

GRADES

The official grades of graduate students are recorded in the office of the Registrar. The Registrar provides official transcripts on the same basis as for undergraduate students. Also, he provides the Dean with the grades of all students in order that the Dean may be able to advise students concerning their programs.

The grading of graduate students is done according to the following scale:

A—high achievement	4 grade points per credit
B—satisfactory achievement	3 grade points per credit
C—minimum passing grade	2 grade points per credit
E—failure	0 grade points per credit
I—incomplete	see explanation below
S—satisfactory	see explanation below

A grade of *I* (incomplete) may be assigned to a graduate student if a part of the work of a course remains undone and there is a reasonable possibility that a passing grade will result from completion of the work. No student may graduate with an *I* on his record without the permission of his adviser and the approval of the Dean of the Graduate School.

A grade of *S* (satisfactory work in progress) may be recorded for students in graduate courses which carry no credit and in graduate seminars, independent work courses, and research courses which extend beyond the normal limits of a semester or summer term. The grade may not be given to a student in a course carrying credit if the student has done unsatisfactory work or if he has failed to do a reasonable amount of work. The project must be substantially continuous in its progress. When the work has been completed, a final grade will be substituted for the *S*.

Once a grade (other than an *I* or *S*) has been reported to the Registrar's Office, it may not be changed unless an error was made at the time the grade was given and recorded, and then only upon the written unanimous approval of the instructor, the Registrar, and the Dean of the Graduate School.

CREDIT EQUIVALENCE

Certain research courses carry no credit hours or grades but do contribute to the residence requirements of graduate degrees. For these courses the credit equivalent is stated in the course descriptions.

ACADEMIC LOAD

The total term load of a student is the sum of all credits and credit equivalents being carried. The normal load of a graduate student during any semester is 12 credit hours or equivalent and under no circumstances may it exceed 15 credit hours or equivalent. In the summer session the normal load is six credit hours and the maximum nine. Students satisfactorily completing in residence nine course credits, or equivalent, of graduate level work during a semester, or six course credits, or equivalent, during a summer term are classified as full-time or full-residence students. Those completing less than these amounts are classified as part-time or part-residence students.

A full-residence student who falls below the minimum full-residence equivalent as the result of failing or dropping one or more courses is reclassified as a part-time or part-residence student for that term.

A master's candidate working on his thesis may register for up to the equivalent of six course credits by signing for course 768 in the appropriate department and indicating the desired credit equivalent in parentheses on the registration card.

A doctoral candidate working on his dissertation may register for up to the equivalent of 12 credits by signing for course 769 in the appropriate department and indicating the desired credit equivalent in parentheses on the registration card.

Graduate students serving in the University as assistants or part-time instructors should register for less than the normal load, as determined by their advisers. Persons holding full-time working or professional assignments, whether employed by the University or not, may not take for graduate credit toward a degree in any single semester or term more than five credit hours. A student may petition for a waiver of this rule if he meets the following conditions: (1) has satisfactorily completed six credit hours of graduate work; (2) has attained higher than national average scores on the aptitude and advanced tests of the Graduate Record Examination; (3) and has appropriate employment facilities and conditions.

SHORT COURSES: WEEKLY COURSES

Short courses are defined as courses of less than a term in length; weekly courses are courses of more than one credit that meet only once a week. A short course may not carry credits greater than the number of weeks during which it is offered. Two short courses of four weeks or less or two full-term courses and a short course may not be taken simultaneously. A total graduate program may not be made up of short courses. Not more than 12 hours of the course work require-

ments for a degree may consist of courses (resident and extension) that meet only once a week.

TIME LIMIT FOR DEGREES

No course or equivalent credit may be given for graduate study completed more than eight years prior to the end of the semester at which the student expects to receive his degree unless such credit or equivalent is specifically validated by the Graduate Council on written recommendation of the appropriate director of graduate study. No course or equivalent credit may be validated in this manner if completed more than 12 years prior to the end of the semester in which the student expects to receive his degree.

GRADUATION

Advanced degrees may be conferred at the close of any semester or summer session, but commencement exercises are held only at the close of the academic year. A student who is scheduled to receive his degree at the close of the academic year is expected to attend the commencement exercises unless he is excused in writing by the Dean of the Graduate School. Students who are eligible to receive degrees at the end of a first semester or a summer session may elect to defer their graduation and participate in the next commencement exercises. Appropriate academic costume must be worn. The graduation fee covers the cost of the diploma, the hood, and, in the case of the master's degree (with thesis), the binding of the thesis.

To be eligible for a degree, the student must file an application at the Graduate Office within 30 days after the beginning of the semester or 15 days in the Summer Session in which he expects to complete his work. The degree applicant must pay his graduation fees within 60 days after the beginning of the semester or 30 days in the Summer Session in which he expects to complete his work.

FEES

Registration fees per semester are $165.00 for residents of Kentucky, $515.00 for non-residents. *New credit hour fees for part-time students had not been established at the time the 1970-71 Graduate Bulletin went to press.* When these hourly fees are established, information may be obtained from the Registrar's Office, University of Kentucky, Lexington 40506. Resident students carrying full loads in the summer will pay $96.00, non-resident students $260.00. Those taking less than full loads pay the regular semester credit fee. The Registrar determines the status of one's residence for purposes of assessing fees.

Graduate fellows, graduate assistants, and instructors pay the fees assigned to Kentucky residents.

General Requirements for All Masters' Degrees

(See also pages 15-19)

ON-CAMPUS RESIDENCE

At least 18 semester hours of the minimum degree requirements must be earned while in residence on the Lexington campus of the University of Kentucky. Normally, candidates for masters' degrees must spend at least two full summer terms or one semester in full residence at the University. For individual superior students the full residence requirement may be waived if recommended by the director of graduate study in the student's major area and approved by the Graduate Dean. Minimum eligibility for being so recommended includes: (1) the satisfactory completion of 12 credit hours of graduate work, (2) the attainment of national average scores on the Graduate Record Examination, and (3) the availability of employment facilities and conditions which make feasible satisfactory completion of degree requirements while the student is fully employed.

TRANSFER OF CREDITS

With the approval of his graduate adviser and the dean, a student may transfer up to six credit hours toward the satisfaction of the minimum requirements of the Graduate School for the master's degree, provided the work in question was taken while he was enrolled in residence in an approved graduate school.

EXTENSION AND CORRESPONDENCE WORK

Under certain conditions, up to six of the credit hours required for any master's degree may be earned in extension courses given in person by University of Kentucky instructors. No graduate credit is given for courses taken by correspondence.

M.A. OR M.S. DEGREE

Whether a candidate selects a Master of Arts or a Master of Science degree is left to the option of the candidate and his major department. In general it may be said that a candidate with major work in the natural sciences should take the M.S. degree; others the M.A.

COURSES AND CURRICULA

Graduate students are eligible to take regular courses which meet as organized classes and independent-study or research courses in which each student carries on investigations independent of class meetings. Independent study or research courses may not duplicate thesis work; thesis work must be done in addition to the minimum course requirements. At least two-thirds of the minimum requirements for the master's degree must be in regular courses, and at least half of the minimum requirements must be in courses numbered on the 600 or 700 level. Exceptions to this rule may be made only with the approval of the Graduate Council.

A student may work toward only one master's degree at a time. He must establish at least one year of residence while earning a second master's degree.

EXAMINATIONS

A final examination (oral and/or written) is given all candidates for masters' degrees not later than eight days before the close of the semester in which the degree is to be awarded. The examination is scheduled by the Graduate Dean and the report is returned to him upon completion of the examination, which in no case may be later than two weeks after the start of the examination. The examining committee consists of at least three qualified members recommended by the director of graduate study and appointed by the Dean of the Graduate School.

If the candidate fails his final examination, the committee may recommend to the Graduate Council the conditions under which a second examination may be administered. Insofar as it is practicable the same examining committee gives this examination. In all decisions the majority opinion of the committee prevails. If the committee is evenly divided, the candidate fails. A third examination may not be allowed.

FEES

Before any master's degree may be conferred the student must pay a commencement fee of $25.00 at the Billings and Collections Office.

Requirements for the Degrees of Master of Arts and Master of Science

The Graduate School authorizes all ~~departments which are approved for graduate work and~~ which wish to do so to permit students to satisfy the requirements for the M.A. and the M.S. degrees by either of two plans.

Plan A

In addition to meeting all general requirements for masters' degrees (see pp. 15-21) the candidate must complete at least 24 semester credit hours of graduate course work with a standing of 3.0 (*B*) or higher, satisfy the language requirements, and write a thesis. A candidate must have a major area (defined usually as an academic department) and must (with the exceptions noted below) take at least two thirds of his courses in this area; the other one third may be taken in this area or in areas which have a graduate relationship to it. In Education, Agriculture, and Communications only one half of the work must be in the major area. When the setting up of major topics seems to require it, the Graduate Council may, on recommendation of the appropriate director of graduate study, authorize courses taught outside the major to count on the major.

THESIS

Two typewritten, unbound copies of the thesis must be presented to the Graduate School Office not later than two weeks before the last day on which grades may be reported to the Registrar's office. These copies must be approved by the thesis director and the appropriate director of graduate study, must be on 100 per cent rag or cotton fiber paper, and must be in a form acceptable to the Graduate School. Instructions for the preparation of theses should be obtained from the Graduate Office before the thesis is typed. The candidate must also submit an abstract of his thesis which does not exceed 200 words and is suitable for publication. The final examination may not be taken before the thesis has been accepted by the Graduate School Office.

Theses must be developed under the direction of a member or associate member of the Graduate Faculty. Collaborative group effort by two or more graduate students is not forbidden, but there must be enough independent effort to enable each student to make a separate contribution and to prepare an individual thesis.

Each thesis must be acceptable to the examining committee at the time of the final examination.

Theses submitted by candidates become the physical property of the University of Kentucky and authors agree that the University may decide the conditions under which they may be used or published. The University protects the authors' rights by placing certain restrictions upon borrowers' use of theses as long as they are unpublished. A copy of the following regulations (to be prepared by the student) is placed before the title-page of every thesis.

> Unpublished theses submitted for the masters' and doctors' degrees and deposited in the University of Kentucky Library are as a rule open for

inspection, but are to be used only with due regard to the rights of the authors. Bibliographical references may be noted, but quotations or summaries of parts may be published only with the permission of the author, and with the usual scholarly acknowledgments.

Extensive copying or publication of the thesis in whole or in part requires also the consent of the Dean of the Graduate School of the University of Kentucky.

A library which borrows this thesis for use by its patrons is expected to secure the signature of each user.

Name and Address Date

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FOREIGN LANGUAGE REQUIREMENT:

A reading knowledge of a modern foreign language is required. Ordinarily this language will be French, German, or Russian, but another language may be substituted if it can be shown to be pertinent to the student's program and is approved by the adviser and the Dean of the Graduate School. The language requirement must be satisfied by an examination given by the appropriate language department of the University or by such persons as the Graduate Dean may specify, or by passing, with a grade of A or B, one or more of the accelerated courses especially designed for this purpose (French 011, German 021, Italian 009, Spanish 011). The student who satisfied the undergraduate foreign language requirement *at the University of Kentucky* with a grade average of B or better may use this as satisfying a graduate foreign language requirement with the approval of his adviser and the Dean of the Graduate School. A candidate for a degree in the language which is his native tongue must do a full minor (one third of his work) in areas in which English is the language employed.

Plan B

Plan B (which is not necessarily available in all departments that have Plan A) has the same minimum requirements as Plan A except that six or more credit hours of course work may be submitted for a thesis. A student may follow this plan only with approval of the department concerned.

A student should consult his adviser for any additional requirements that may have been set up for Plan B by his area of study.



Specialized Masters' Degrees

Special requirements concerning the Master of Science in Accounting, the Master of Science in Agriculture, the Master of Science in Clinical Nutrition, the Master of Science in Dentistry, the Master of Science in Home Economics, the Master of Science in Library Science, the Master of Arts in Education, the Master of Science in Education, the Master of Music, the Master of Science in Nursing, the Master of Social Work, the Master of Science in Statistics, the Master of Business Administration, the Master of Science in Radiological Health, the Master of Science in Medical Radiation, and the Master's Degrees in Engineering are explained in the section of the *Bulletin* which outlines departmental offerings.

Requirements for the Degree of Doctor of Philosophy

The degree of Doctor of Philosophy is conferred upon a candidate who, after completing not fewer than three years of graduate work devoted to study of a special field of knowledge, presents a satisfactory

dissertation, passes a comprehensive examination on his dissertation subject and chosen field, and shows sufficient promise of scholarly attainment.

The doctor's degree is intended to represent not a specified amount of work covering a specified time, but the attainment, through long study, of independent and comprehensive scholarship in a special field. Such scholarship should be evidenced both by the student's grasp of subject matter and by his capacity to do research.

THE STUDENT'S ADVISER AND SPECIAL COMMITTEE

The director of graduate study in the student's major area serves initially as the student's adviser and signs his schedule before it is presented to the Dean. When the dissertation director has been chosen, the student's special committee is set up by the Dean after he has conferred with the student, the director of graduate study, and the dissertation director.

The special committee consists of the dissertation director as chairman, two or three other members from the major area, and at least one representative from each minor area—in all, no fewer than five members. This committee advises the applicant and sets the requirements which the student must meet before he may be admitted to the qualifying examination. The special committee keeps minutes of all meetings and sends abbreviated copies to the Dean to be made a part of the student's record. Ordinarily this committee determines when the qualifying examination is to be administered, and the chairman schedules the examination in writing, sending a copy of the announcement to the Dean. The committee is the final judge on a majority basis of the questions to be asked on the qualifying examination and of whether the student passes.

A department which elects to do so may give a uniform departmental qualifying examination to its candidates instead of delegating full responsibility to the special committee.

MAJOR AND MINOR SUBJECTS

Every applicant for the Ph.D. degree must select a major area of study and some programs require one or two minor areas. The major area is one in which the student intends to concentrate his efforts.

If a minor area is required, this area must be approved by the Graduate Dean and the subjects to be included in the minor(s) must be approved by the representatives of the minor(s) on the special committee. Normally, when an outside minor is required, at least one-sixth of the student's program should be devoted to study in this area.

RESIDENCE REQUIREMENTS

A minimum of three collegiate years of full-residence graduate work or its equivalent in a combination of full- and part-time residence, is required for the doctorate. At least two semesters (exclusive of summer sessions) of the required residence above the master's degree (or its residence equivalent) must be earned at the University of Kentucky in full-residence status, or in a combination of graduate study, research, and not more than half-time assignment as a research or teaching assistant. "Residence equivalent" to the master's degree is interpreted as one academic year of full-residence graduate work or its equivalent in a combination of full and part-time residence.

A year of residence is required after the qualifying examination before the degree is conferred. If the examination is completed within the first six weeks of a semester, that semester will count as half the year. If a student has passed his qualifying examination but has earned less than one year of residence after the qualifying examination, he may petition the Graduate Dean for a waiver of this requirement.

The amount of residence to be transferred on account of prior graduate work at some other institution is determined jointly by the director of graduate study in the area and the Dean of the Graduate School. Ordinarily, however, graduate students may be allowed only one year of residence toward the doctorate for earlier study which has been used to satisfy the requirements for a master's degree or masters' degrees.

Candidates working on the dissertation project who need residence credit should register for course 769 in proportion to the amount of time to be devoted to the project. Students working full-time on the dissertation should register for the equivalent of 12 credits; i.e. 769 (12). Those devoting less than fulltime should register for proportionately less 769 residence.

Should conditions merit or require that all or part of the dissertation project be carried out away from the campus of the University of Kentucky and the arrangement has the approval of the candidate's dissertation director and the Dean of the Graduate School, needed minimum residence credit can be gained by registering for course 769 as described above for on-campus candidates.

Students with full-time positions and who are taking no credit course work may register for no more than the 769 equivalent of 5 credits per semester or 3 credits per summer term.

While it is expected that a well-prepared student of good ability may secure the degree upon completion of three years of full-time study, it should be understood that this requirement is a minimum and is wholly secondary to scholarly accomplishment.

Students who have fulfilled the minimum residence requirements for a graduate degree and who are not registering for course credits but who are carrying out on-campus dissertation work, hence are utilizing University faculty and/or facilities either full-time or part-time, must register during each term of such on-campus activity.

LANGUAGE REQUIREMENTS

As stated in the specific program description, an applicant must have a reading knowledge of one or two modern foreign languages. The language or lauguages will normally be chosen from French, German, or Russian. However, with the approval of the student's special committee, the director of graduate study in the area, and the Graduate Dean, certain substitutions may be made:

1. Some other language may be substituted for one of those normally required if it can be demonstrated that the student's scholarly needs will be better served thereby.
2. In special cases fluency in one foreign language may be substituted for a reading knowledge of two languages.

If after four semesters of full-time graduate work (i.e., above the A.B.) the student has not satisfied the foreign language requirement, he must register for a language course or courses as a part of his course load. The language requirement must be satisfied before the applicant may be admitted to the qualifying examinations. The acceptable ways for satisfying this requirement are given on p. 23.

THE QUALIFYING EXAMINATION

A qualifying examination is required of all applicants for the doctorate in order to determine whether the applicant should be admitted to candidacy. Normally this examination is prepared by the student's special committee (see page 25) and should be taken during or after the student's fourth semester of full-time graduate study, or the equivalent. The qualifying examination shall be both written and oral. The special committee reports to the Dean the result of the examination within 60 days of the beginning. If the result is failure, the committee recommends the conditions to be met before another examination may be administered. The minimum time before another examination may be given is four months. The same committee, or as many of the members as are available, plus those added by the Dean to fill vacancies, gives the second examination. A third examination may not be allowed.

THE DISSERTATION

Each candidate must present a dissertation which is the result of original research and adds to or otherwise modifies what was previously known on the subject. Unless the director of the dissertation specifically recommends departures, the dissertation must be in conformity with the instructions prepared by the Graduate School, must be on 100 per cent rag or cotton fiber paper, and must be satisfactory in style and composition.

Before the dissertation is formally submitted, the student must bring it to the Graduate Office to have it checked for form. Two typewritten copies of the dissertation (unbound) and two typewritten copies of an abstract, usually of not less than 400 words nor more than 600 words, must be presented to the Dean of the Graduate School at least two weeks before the final date on which the Registrar's Office will receive grades of candidates for degrees at the next commencement. An approval sheet signed by a majority of the special committee (including the director of the dissertation) must accompany the dissertation. When dissertations are submitted, a standard form containing RULES FOR THE USE OF THESES must be prepared and must be included with the manuscript, before the title page. (See page 22 for these RULES.)

Each graduating doctoral student will pay a fee of $75.00 to cover microfilming and copyright of the dissertation, binding of the dissertation, and the cost of the hood. Payment will be made at the Billings and Collection Office.

THE FINAL EXAMINATION

After the acceptance of the dissertation by the special committee and the Dean of the Graduate School, the candidate is given a final oral, or, if the examining committee elects, an oral and a written examination. The examining committee consists of a minimum of five persons appointed by the Dean of the Graduate School, after he has conferred with the director of graduate study for the area. The director of graduate study (or his delegate) serves as chairman of the committee. Other members include the dissertation director, a third representative of the department, a representative of the minor area, and one member of the Graduate Faculty associated with neither the major nor minor areas. (The President of the University and the Dean of the Graduate School are ex-officio members of all examining committees.) The final examination includes a defense of the dissertation and may be as comprehensive in the major and minor areas as the committee desires to make it. In all decisions the majority opinion of the committee prevails. If the committee is evenly divided, the candidate fails.

If the candidate fails, the committee may recommend to the Graduate Dean the conditions under which the candidate may have another examination. This examination will be administered by as many of the original committee members as are available, plus new members appointed by the Dean to fill vacancies.

If the student passes this examination, he will be recommended for the degree at the next commencement, provided one academic year has elapsed since the qualifying examination.

Requirements for the Degree of Doctor of Education

The requirements for the degree of Doctor of Education are the same as for the degree of Doctor of Philosophy with the following exceptions:

1. No foreign languages are required for the Ed.D. degree.
2. A minimum of 72 credit hours is required, at least one third and not more than one half of which must be in departments outside the College of Education.

Applicants for the Ed.D. degree, who are required to do at least one-third of the minimum requirements outside of areas of the College of Education, must declare at least one area other than Education when their special committees are appointed. Two members must be chosen from areas outside the College of Education.

The Graduate Committee of the College of Education and the Graduate Dean will evaluate credits and residence to be allowed transfer students. It is understood, however, that the special committee may accept only such courses as fit into the graduate program of the student.

JOINT-DOCTORAL PROGRAM WITH THE STATE UNIVERSITIES

Doctoral programs in education are offered jointly between the University of Kentucky and the other state universities: Eastern, Morehead, Murray, and Western. These programs permit qualified candidates to complete approximately one year of graduate work above the master's degree at the cooperating university. A minimum of 18 credit hours of course work, the qualifying examination and the dissertation must be completed at the University of Kentucky, and a minimum of one academic year must be spent in full-time residence on the Lexington campus. The work of each candidate is directed by a joint faculty committee from both institutions.

Persons interested in this program should confer with the Dean of the Graduate School at the cooperating university, or the Coordinator of Graduate Studies in Education at the University of Kentucky. Applications may be filed for review by a joint screening committee. Admission will depend upon academic standing, scores on standardized examinations, and personal references.

Requirements for the Degree of Doctor of Musical Arts

The requirements for the degree of Doctor of Musical Arts are the same as for the Doctor of Philosophy, with the following exceptions:

1. Only one foreign language, normally French or German, is required for the D.M.A. degree. The candidate must also demonstrate a working knowledge of musical terms in French, German, and Italian prior to the qualifying examination.
2. The applicant for this degree must have at least two years of successful teaching experience.

Further information concerning prerequisites and courses of study can be found on page 133 of the *Graduate Bulletin*. At present the Doctor of Musical Arts is offered only in the field of Music Teaching.

The Director of Graduate Studies of the Department of Music and the Graduate Dean will evaluate credits and residence to be allowed transfer students. It is understood, however, that the special committee may accept only such courses as fit into the graduate program of the student.

Requirements for the Degree of Doctor of Business Administration

The Doctor of Business Administration is designed primarily for students interested in teaching and research. It focuses on administrative science and requires additional work in research methodology, economic theory, and quantitative analysis.

Major and minor fields may be selected from accounting, behavioral analysis, managerial economics, finance, human resource development, international business, and marketing. Further information concerning prerequisites and courses of study can be found on page 179 of the *Graduate Bulletin*.

Requirements for the Degree of Specialist in Education

The degree of Specialist in Education is conferred upon a candidate who satisfactorily completes a sixth-year planned program in Education under the general requirements of the Graduate School (page 15) and the following special requirements:

Admission

The student, prior to admission to the program, must (1) have a master's degree, (2) ordinarily have a standing of 3.4 or higher on his graduate work, (3) meet the requirements for a teaching certificate or have credentials appropriate to his field of specialization, and (4) have at least 30 credit hours in courses in education (undergraduate and graduate).

A student must file an application with the Dean of the College of Education. The application will be considered by an admissions committee of the College of Education and each student must be recommended to the Graduate School by the division or department in which he plans to major.

Program

The student must earn a minimum of 30 credit hours of graduate work beyond the master's degree (of which at least 15 must be in courses numbered 600 or above).

The division or department in which the student majors is responsible for helping the student plan a program to meet his needs. The program should contribute to specialization in a field but should not neglect the broader development of the individual.

The student must complete an independent research problem (equal to three but not to exceed six credit hours) and submit a written report, a copy of which is to be filed with the division or department directing the research.

With the approval of the Graduate Dean and of the division or department in which he is to major, the student may transfer a maximum of six hours of residence credit earned beyond the master's degree from an institution which is approved to offer work above the master's level.

Final Examination

The final examination required of all candidates is administered by an examining committee consisting of at least three qualified members recommended by the adviser and the director of graduate study and appointed by the Dean of the Graduate School.

Graduate Students Not Applicants for Degrees

Graduate students who are not working toward advanced degrees are not required to designate major or minor subjects, but may elect their work with a view to the special purposes for which they are in attendance at the University.

Any course of study announced for advanced undergraduates and graduates is open for election by such students under the same conditions as apply to candidates for degrees.

Should a graduate student who has not taken his work with a view to obtaining a degree subsequently desire to become an applicant for a degree, the number of credit hours he is to receive for work already done will be determined at the time he applies for admission as applicant for the degree.

Research Program at Oak Ridge Associated Universities

The University is one of the sponsoring universities of the Oak Ridge Associated Universities located at Oak Ridge, Tennessee. Through this association, the University of Kentucky has available to it the facilities of the National Laboratories in Oak Ridge and of the research staffs of these laboratories. When masters' and doctoral candidates have completed their course work, it is possible by special arrangement for them to go to Oak Ridge to work on their research problems and prepare their theses. In addition, it is possible for staff members of the University to go to Oak Ridge for varying periods, usually for not less than three months, for advanced study in their particular fields.

Students on Oak Ridge Graduate Fellowships receive stipends which vary according to the number of their dependents and the level of work they are doing. Staff members may work in Oak Ridge on stipends commensurate with their present salary and rank.

Information concerning stipends and other matters may be obtained from the office of the Graduate School or from the Chairman of the University Relations Division of the Oak Ridge Associated Universities, Box 117, Oak Ridge, Tennessee 37831.

Southern Regional Training Program in Public Administration

Since 1945 the University of Kentucky, the University of Alabama, and the University of Tennessee have conducted a joint program in

public administration leading to a master's degree. Part of the course work is completed at each institution, and three months of successful internship are required. Detailed information concerning the program may be obtained from the Department of Political Science of the University of Kentucky.

Center For Developmental Change

The Center for Developmental Change (CDC) is a special unit which reflects the efforts of the University of Kentucky to define and attack the contemporary problems of social and economic development.

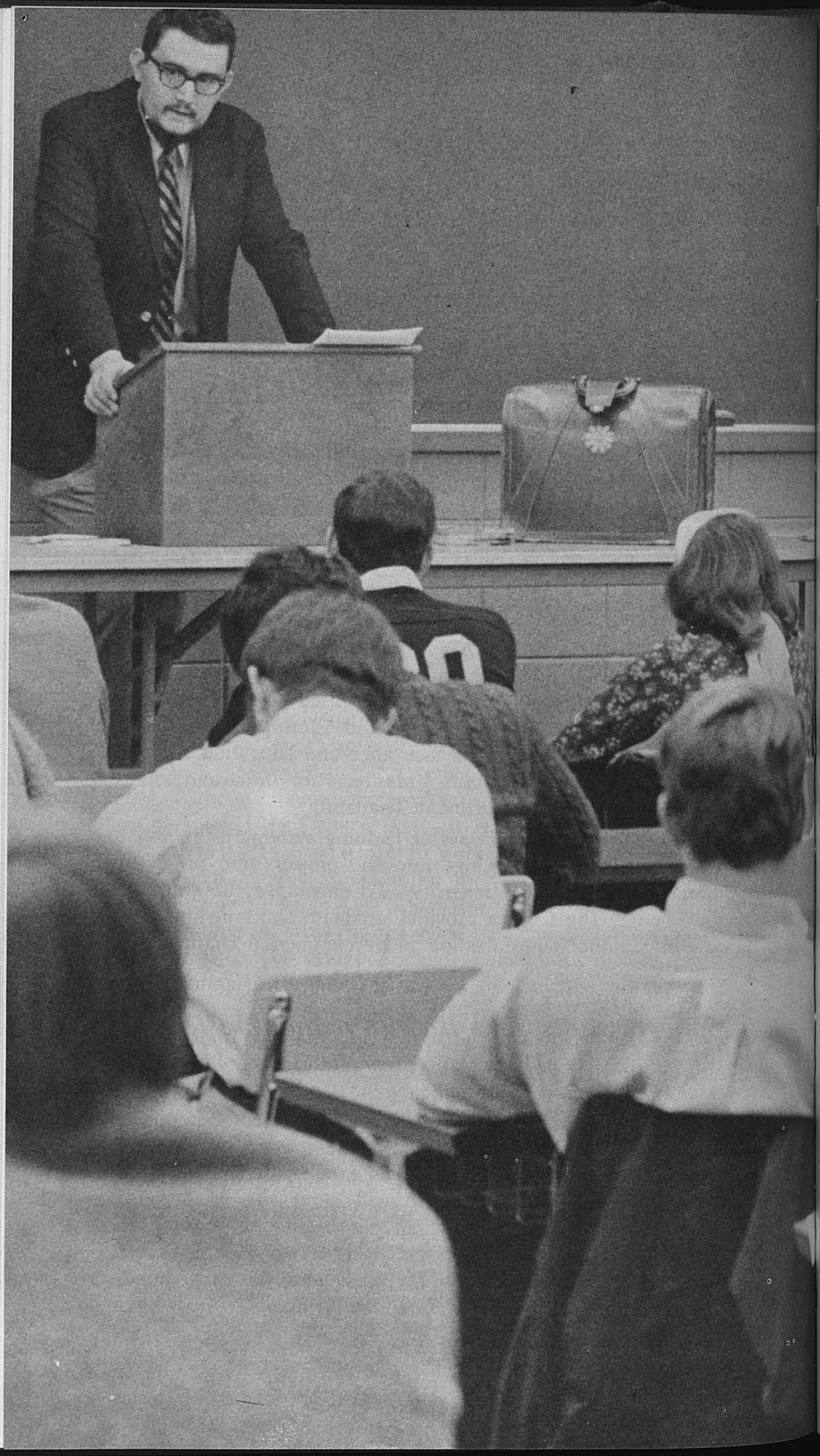
Developmental change is defined as planned and innovated change, directed toward the attainment of chosen goals. The Center undertakes, promotes and stimulates the study of developmental change. It seeks greater understanding of change processes and more widespread dissemination of the knowledge and skills of application. It is concerned with how better to train people to work on development problems.

CDC correlates certain domestic and international research, action, and training programs. Domestic projects are focused on Kentucky and Appalachia, with regional studies of urban and rural problems. The international projects include technical assistance and education support programs, such as training Peace Corps Volunteers for India and establishing an agricultural center in Northeast Thailand.

The Center seeks to introduce ways of learning systematically about the processes of developmental change into the projects and programs of the appropriate units of the University. To encourage the study of developmental change, the Center provides graduate assistantships and coordinates a Ph.D. minor concentration in developmental change.

Advanced Study and Research by Guests of the University

When appropriate resources are available at the time desired, the President of the University, upon the recommendation of the Dean of the Graduate School and the department affected, will welcome advanced scholars as guests of the University, and will grant the privilege of auditing seminars and research courses and of carrying on research in laboratories and libraries. Normally there will be no charge except for laboratory expenses. Negotiations for such arrangements should be conducted in advance through the Graduate Office.



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Non-Service Fellowships Administered by Graduate School

University of Kentucky Research Foundation Fellowships: The University of Kentucky Research Foundation supports six graduate fellowships of $2,400.

Haggin Fellowships: Twenty-eight Haggin fellowships, endowed by Margaret Voorhies Haggin in memory of her father, George Voorhies, carry stipends of $2,400.

National Defense Education Act Fellowships: Three-year fellowships with stipends of $2,400, $2,600, and $2,800 per calendar year for first, intermediate, and terminal-year students. Additional stipend awards available for summer study. Allowance of $500 per dependent.

National Science Foundation Traineeships: One-year traineeship subject to reappointment. Stipend of $2,400, $2,600, $2,800 per calendar year for first, intermediate and terminal-year students.

Dissertation Year Fellowships: Fifty one-year fellowships open to doctoral students who have passed the qualifying examination and will be working on the dissertation. Stipend of $2,800 per academic year.

Graduate Faculty Predoctoral Fellowships: Several one-year fellowships open to beginning graduate students in doctoral programs. Subject to reappointment for a total of three years. Stipend of $4,000 per academic year.

Patterson Fellowships: A number of Patterson Fellowships in amount of $2,400 are available from income from the bequest of President William Andrew Patterson, the first president of the University, for students with a major interest in diplomacy and international relations. Applicants who state their major subject to be Diplomacy and International Commerce automatically will be considered for Patterson as well as any other fellowship support for which they are eligible.

The Dr. Paul I. Murrill Memorial Scholarship: This scholarship was set up by Mrs. Paul I. Murrill in honor of her husband, who was a graduate of the University of Kentucky. It pays a variable stipend of approximately $2,500 a year to a student who possesses outstanding qualities of character and aptitude for fruitful graduate work. Preference shall be given to scholars in the field of chemistry.

The Robert N. Jeffrey Fellowships: These three fellowships are supported by the Jeffrey Memorial Endowment Fund set up by Mrs. Helen Lasby Jeffrey in honor of her husband, Robert N. Jeffrey, who was formerly Plant Physiologist at the Agricultural Experiment Station. These fellowships pay a stipend of $2,400 to $2,800 and are subject to renewal if the progress of the student is satisfactory. They are open to Ph.D. applicants in all areas of the University concerned with

tobacco research. The fellows' dissertation research must apply directly to tobacco.

Summer Fellowships: Two month fellowships with stipends of $480, $520 and $560 for first, intermediate and terminal-year students.

Forms for making application may be secured from the office of the Dean of the Graduate School and must be submitted not later than February 1 of each year, except that the deadline for the summer fellowship is March 1.

All fellowships waive out-of-state fees and full fees are paid for NDEA Fellowships and NSF Graduate Traineeships.

Other Fellowships

The George W. Pirtle Fellowship in Geology: A grant of $500 a year is given by George W. Pirtle to a graduate student in geology upon the recommendation of the faculty of the Department of Geology. The grant is given in honor of Dr. A. C. McFarlan.

J. Stephen Watkins Foundation Fellowship for Civil Engineering: The Watkins Fellowship, contributed by the J. Stephen Watkins Foundation, carries a stipend of $2,400, and has been offered every other year beginning in 1965.

Automotive Safety Foundation Fellowships for Civil Engineering, with stipend of $3,000.

United States Steel Foundation Fellowship for a graduate student in history. Stipend of $2,400 annually for two years.

Office of Civil Defense Fellowships in Nuclear Science and Engineering with stipend of $2,200.

Research and Teaching Assistantships

Most departments employ part-time teaching and research assistants at stipends ranging up to $3,000, plus ~~waiver~~ of out-of-state fees. Information concerning assistantships may be obtained from the various departments.

Miscellaneous Financial Support

Certain additional moneys supportive of the doctoral programs are available. These include funds to cover travel expenses necessary to dissertation research; certain dissertation costs, e.g. obtaining microfilm, reproducing and mailing questionnaires, etc.; travel expenses incurred in

presenting papers based on dissertation research at national meetings; and tuition fees for doctoral students who must attend another institution in order to secure credits essential to the student's program. Also, allocations are available for the enrichment of doctoral programs covering such areas as seminars, topical conferences, and research assistantship support. Most of these funds are from NDEA and NSF Cost-of-Education allowances.

Subjects and Directors of Graduate Study

The courses offered for graduate work are listed under the following groups:

Subjects	*Directors of Graduate Study*
I. Agriculture	
Agricultural Education	Harold R. Binkley
Agricultural Economics	Robert W. Rudd
Agricultural Engineering	Blaine F. Parker
Agronomy	A. J. Hiatt
Animal Sciences	W. P. Garrigus, George E. Mitchell, Jr.
Entomology	B. C. Pass
Forestry (No graduate major offered in this department)	
Home Economics Education (See Education)	
Horticulture	Hubert C. Mohr
Plant Pathology	Stephen Diachun
Plant Physiology	~~W. A. Kendall~~ CLAUS GRUNWALD
Soil Sciences	R. E. Phillips
Veterinary Science	J. H. Drudge
II. Arts and Sciences	
Anthropology	~~Art Gallaher~~ Buffalo 1990-1
Art	James S. Pierce
Biology	Samuel F. Conti
Botany	Samuel F. Conti
Chemical Physics	Ben Gossick
Chemistry	Robert W. Kiser
Communications	Robert D. Murphy
Classical Languages	Hubert M. Martin, Jr.
Computer Science (At present no graduate majors are offered in this subject)	SHELDON SIMON
Diplomacy and International Commerce	~~Lloyd Jensen~~
Economics (See Business and Economics)	
English	Robert D. Jacobs W. S. Ward, Donald A. Ringe
French Languages	Raymond La Charité
Geography	P. P. Karan
Geology	~~William H. Dennen~~
Germanic and Classical Languages	Wayne Wonderley
Greek (See Classical Languages)	
History	~~Carl B. Cone~~
Journalism (See Communications)	
Latin (See Classical Languages)	
Mathematics	James H. Wells
Microbiology	~~Earle Swim~~
Music	~~Paul Lehman~~
Philosophy	Dallas M. High

Physics and Astronomy ..... Ben Gossick
Political Science ..... Malcolm Jewell
Psychology ..... Robert A. Baker
Sociology ..... Milton Coughenour
Spanish ..... William C. McCrary
Speech (See Communications)
Statistics ..... Richard L. Anderson
Telecommunications (See Communications)
Theatre Arts ..... Raymond Smith
Zoology ..... Thomas C. Barr, Jr.

III. Business and Economics

Business Administration ..... Joe Logan Massie
Economics ..... Joe Logan Massie

IV. Education

Administrative and Supervision ..... J. R. Ogletree, James Kincheloe
Agriculture Education ..... Harold Binkley
Business Education ..... V. A. Musselman
Counseling ..... (Acting) Dwight Auvenshine
Educational Psychology and Counseling ..... Louis Karmel, James R. Barclay
Elementary Education ..... James Moore
Higher and Adult Education ..... Collins Burnett
Home Economics Education ..... (Acting) Marjorie Stewart
Health, Physical Education, and Recreation ..... ~~Joseph Gruber~~ DONALD R. KIRKENDALL
Secondary Education ..... Harry Barnard
Social and Philosophical Studies in Education .... David Denton
Special Education ..... A. Edward Blackhurst

V. Engineering

Agricultural Engineering ..... Blaine F. Parker
Chemical Engineering ..... Robert B. Grieves
Civil Engineering ..... Don J. Wood
Electrical Engineering ..... Robert L. Cosgriff
Engineering Mechanics ..... O. W. Dillon
Mechanical Engineering ..... Roger Eichhorn
Metallurgical and Mining Engineering ..... Hans Conrad

VI. Medicine

Anatomy ..... Harold F. Parks
Biochemistry ..... Fred J. Bollum
Pharmacology ..... Tihamer Z. Csaky
Physiology and Biophysics ..... Fred W. Zechman, Jr.
Toxicology ..... Tihamer Z. Csaky

VII. Pharmacy

Pharmaceutical Sciences ..... H. B. Kostenbauder

VIII. Allied Health Professions

Clinical Nutrition ..... Paul Thornton
Radiological Health ..... Joseph A. Sayeg
Medical Radiation ..... Robert H. Greenlaw

IX. Home Economics

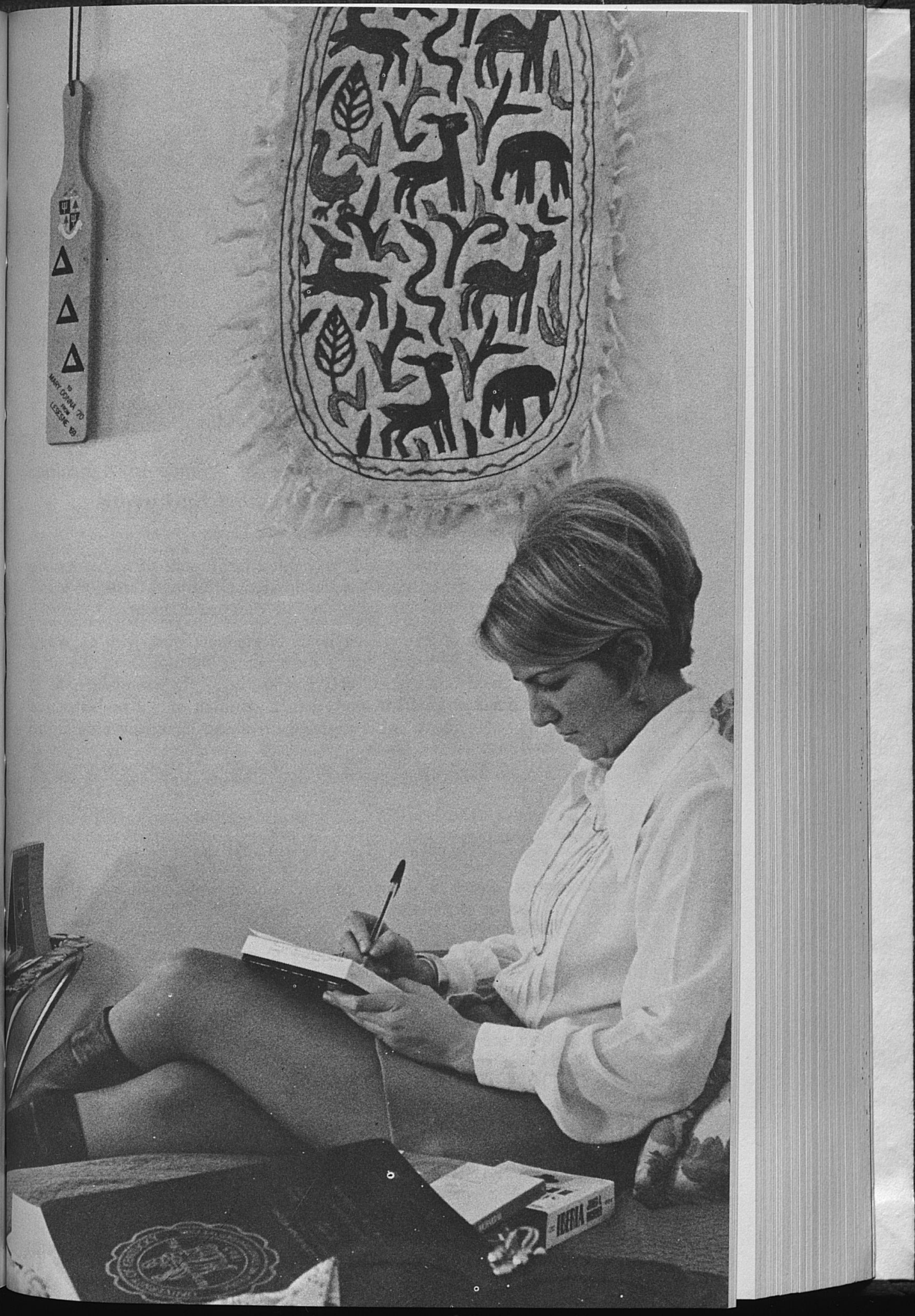
Home Economics ..... Betty Jean Brannon
Nutrition and Food Science ..... Leonard Packett

X. Library Science ..... Lawrence Allen

XI. Dentistry ..... William R. Proffit

XII. Nursing ..... Jean Hayter

XIII. Social Work ..... Ernest F. Witte



Graduate Courses of Study

Note: Arabic numbers in parentheses indicate the number of semester hours given for each course, and the Roman numerals refer to the semester in which the course is offered; S stands for the summer session.

I. AGRICULTURE

Requirements for the Degree of Master of Science in Agriculture and Master of Science in Agricultural Engineering

(See also pages 15-23.)

Students who are graduates of fully accredited institutions of higher learning may obtain the degree of Master of Science in Agriculture or Master of Science in Agricultural Engineering by satisfying the following requirements:

1. The completion of 24 semester hours of graduate work with an average standing of 3.0 or better, and a thesis, or at the option of the major professor (except in Agricultural Engineering), the completion of 36 semester hours of graduate work with a standing of 3.0 or better, and no thesis requirement. At least one-half of the hours must be on the 600 level or above.
2. There is no language requirement for either of these professional degrees.

AGRICULTURAL ECONOMICS

The degrees of Master of Science, Master of Science in Agriculture (Plan B available), and Doctor of Philosophy may be earned with a major in agricultural economics. The student is expected to concentrate, in addition to agricultural economics, in economics and subjects relating to research methodology. Those without sufficient background or training are expected to make up deficiencies indicated by the department.

The beginning graduate student is advised to choose between two program emphases, applied or research, according to his career interests. The applied sequence trains the student broadly in subjects that will have a continuing usefulness in business, agricultural program administration, extension, foreign service and the like. It is designed for those who do not plan to undertake Ph.D. programs. The research emphasis in the M.S. program involves more work in the basic fields of economic theory, statistics and research methodology and is designed to prepare the student for Ph.D.-level work. Those with the applied emphasis in the M.S. program will ordinarily require an additional semester

of study to eliminate deficiencies in the basic fields if they decide to pursue Ph.D. work.

All students seeking the Ph.D. must satisfactorily complete a small core curriculum of courses in statistics, economics and agricultural economics, and demonstrate a reading knowledge of one modern foreign language. A brochure is available which details the core curriculum and the recommended content of the two emphases in the master's degree program.

U.K. graduates with Ph.D. degrees are now employed in administrative positions in academic institutions, in business, government programs for agriculture, foreign technical-assistance positions or extension. In addition to agricultural economics courses, the student may select courses from a broad array of agricultural and social science disciplines which will fit him best for his particular professional career interest.

AGRICULTURAL MARKETING

401 *Marketing Tobacco.* (2) II

Special emphasis on the marketing of and the market system for tobacco. Application of marketing principles and methods to tobacco. Prereq: AEC 300. *Clark.*

402 *Tobacco Market Grades and Grading.* (1) II

Procedures and problems in establishing market standards for tobacco, including practice in grading. Prereq. or concur: AEC 300 or approval of instructor. *Clark.*

403 *Marketing Livestock and Livestock Products.* (2) II

Analysis of livestock and dairy markets; market organization, agencies, institutions, services; public regulations. Prereq: AEC 300. *Gooch.*

501 *Economics of Agricultural Marketing.* (3) II

Analysis of agricultural markets with major emphasis on use of the theoretical tools—pricing practices, product choice, advertising firm and industry growth, location and economic development. Three class hours per week. Prereq: AEC 300. *Mather.*

505 *Structure and Organization of Agricultural Businesses.* (3) II, S

Understanding of the structure and organization of agriculturally-related businesses and industries, including cooperatives, and the influence of these on key management decisions by owners and managers of farms, as well as policy and decision-makers in such businesses.

606 *Advanced Agricultural Marketing.* (3) II

A critical examination of objectives and results of various types of research in market organization, marketing functions, market management, and price analysis. Prereq: approval of instructor. *Rudd and Mather.*

FARM MANAGEMENT

409 *Decision-making in Agricultural Business Firms.* (3) II

Analysis of the major types of management problems commonly faced by agricultural business firms, formulation of alternative courses of action with emphasis on sound approaches to solutions and determination of business policy decisions. Three class hours per week. Prereq: Permission of instructor. *Binkley.*

415 *Farm Accounting and Record Analysis.* (3) II

Development and analysis of records to farming situations. Interpretation of essential records from a farm manager's viewpoint as a means of improving decision-making. Lecture, three hours per week. Prereq: AEC 310. *Criswell.*

511 *Advanced Farm Management.* (3) II, S
An advanced analysis of management and managing farms. Prereq: AEC 310. *Justus.*

516 *Land Value and Appraisal.* (odd years) (3) I
The capitalization process, and other methods of valuing farm land; appraisal procedures of the Federal Land Banks and other credit institutions. Prereq: AEC 310, or approval of instructor. *Bondurant, Justus.*

518 *Farm Labor Utilization.* (3) I
Efficient work method fundamentals as applied to agricultural production, work simplification analysis of specific farm jobs and incentive payment plans for encouraging economic use of farm labor, are studied. Prereq. or concur: AEC 310. *Byers.*

PRODUCTION ECONOMICS

520 *Production Economics.* (3) I
Economic analysis of agricultural production. A theoretical treatment of land and capital returns, costs and related functions of agricultural production at an elementary level. Prereq: AEC 310. *Redman.*

620 *Economics of Agricultural Production: Static Application.* (3) II
Application of economic principles to agricultural production problems of resource combination, enterprise selection, scale of operations, household-firm relationships, interregional competition, and national agricultural policies and programs. Prereq: Approval of instructor. *Redman.*

621 *Economics of Agricultural Production: Dynamic Application.* (3) I
A continuation of AEC 620 with application to dynamic situations. Prereq: AEC 620 and approval of instructor. *Redman.*

MATHEMATICAL ECONOMICS

590 *Introduction to Mathematical Economics.* (3) II
A review of mathematical approaches to economic theory. Models applicable to production, marketing and pricing problems. Prereq: ECO 361 or equivalent (same as ECO 590).

690 *Mathematical Economics—Macro Theory.* (3) I
Selected aggregative models treated mathematically. Emphasis on maximization problems for linear systems. Leontief input-output models. Prereq: ECO 360, MA 113, or equiv. (Same as ECO 788).

691 *Econometrics II.* (3) II
The application of statistical methods to problems of economic analysis. Building and measuring relationships among economic variables. Econometric models of the economy as a whole and of individual sectors. Prereq: ECO 692 or equivalent. (Same as ECO 792.)

AGRICULTURAL POLICY AND LAND ECONOMICS

540 *Agricultural Policy.* (3) I
Historical development of principles underlying agricultural policy; objectives of agricultural policy; appraisal of current and proposed agricultural programs. Prereq: AEC 300. *Anschel.*

545 *Land Economics.* (3) I
Institutional, technological and physical forces affecting the use of land resources in agriculture. Analysis of problems connected with land tenure, land conservation and transfer of farm real estate. Prereq: AEC 310, or approval of instructor. *Bondurant and Redman.*

640 *Advanced Agricultural Policy.* (3) II
Impacts of policies upon economic progress, efficiency in resource use, distribution of income, and welfare in agriculture. Prereq: approval of instructor. *Rudd.*

AGRICULTURAL ECONOMIC DEVELOPMENT

626 *Agriculture and Economic Development.* (3) II
Analytical consideration of role of agriculture in economic development in relation to overall development strategy at various stages of growth. Theoretical and policy issues of particular relevance to the agricultural development in underdeveloped agrarian economies with various resource, social, political and economic systems. Prereq: ECO 475 or consent of instructor (same as ECO 674). *Anschel and Brannon.*

AGRICULTURAL PRICES AND FINANCE

455 *Agricultural and Farm Finance.* (3) I, S
Credit needs of agriculture; problems connected with farm and market agency financing; organization and operation of agricultural credit agencies. Prereq: AEC 310; ECO 260. *Clark, Criswell.*

550 *Agricultural Prices.* (3) II
Price behavior of agricultural products including supply-price relationships and general price-level. Prereq: ECO 260. *Bobst.*

650 *Advanced Agricultural Prices.* (3) I
Advanced study of agricultural price behavior by the application of economic theory and statistical analysis. Prereq: approval of instructor. *Rudd and Bobst.*

SPECIAL PROBLEMS

580 *Special Problems in Agricultural Economics.* (1-3) I, II
Directed independent study of a selected problem. Prereq: approval of instructor and chairman of department. *Rudd, Staff.*

780 *Special Problems in Agricultural Economics.* (3) I, II, S
Open to graduate students who have the necessary training and ability to do research on some selected problem. Prereq: approval of chairman of department. *Rudd, Staff.*
May be repeated to a maximum of nine credits.

RESEARCH METHODS

560 *Introduction to Research Methods in Agricultural Economics.* (3) I
Survey of agricultural economics research areas, methods of initiating, preparing and conducting research projects, financing agricultural research. Applicable to problems of agricultural production and marketing. Prereq: Senior standing and consent of instructor. *Smith.*

660 *Research Methods in Agricultural Economics.* (3) II
An analytical examination of research methods and techniques used in agricultural economics. Prereq: approval of instructor. *Redman.*

661 *Programming Models in Agricultural Economics* (3) I
A study of some programming models useful in agricultural economics; includes an examination of the structure of the models themselves, economic interpretation of their components and their use in research in agricultural economics. Prereq: Consent of instructor. *Bradford.*

SEMINAR

770 *Agricultural Economics Seminar.* (0) I, II
Analysis of economic problems which affect agriculture. *Staff.*
May be repeated three times.

768 *Residence Credit for the Master's Degree* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

AGRICULTURAL EDUCATION

For description of program, see page 223

AGRICULTURAL ENGINEERING

For description of program, see page 228

AGRONOMY

The Department of Agronomy offers graduate work leading to the master's degree with majors in crop science or soil science and to the Ph.D. degree with a major in soil science. Work leading to advanced degrees must conform to the general rules and regulations of the Graduate School, except that a reading knowledge of one modern foreign language is required for the Ph.D. in Soil Science. The department permits use of Plan A or Plan B to satisfy the requirements for the M.S. degree.

The Department of Agronomy also participates in an interdepartmental graduate program leading to the Ph.D. degree with a major in plant physiology.

GENERAL COURSES

599 *Special Problems in Agronomy.* (1-4) I, II, S
Prereq: Consent of instructor.
May be repeated for a maximum of nine credits. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Agronomy Seminar.* (1) I, II
Reports and discussion of problems and investigations of problems in soils, crops and plant physiology. May be repeated three times for maximum of four credits.

799 *Research in Agronomy.* (1-4) I, II, S
Prereq: Consent of instructor.
May be repeated for a maximum of twelve credits. *Staff.*

CROP SCIENCES COURSES

502 *Ecology of Economic Plants.* (3) I

Critical study of the response of economic plants to natural and man-modified environments. Lecture, 2 hours; lab, 2 hours. Prereq: BOT 101 and AGR 206 or consent of instructor. *Duncan.*

503 *Weed Identification and Control.* (3) I

The important characteristics, identification, and control of weeds, with emphasis on identification and control of Kentucky weeds. Lecture, 2 hours. Prereq: AGR 206. *Herron.*

506 *Introduction to Plant Breeding.* (3) II

A study of the principles involved and the techniques used in breeding crop plants. Lecture, 2 hours; lab, 2 hours. Prereq: AGR 206, BOT 530 or ASC 260. *Poneleit.*

508 *Advanced Crops: Tobacco.* (3) I

Origin of the nicotiana species, botany, pathology, entomology, physiology, breeding, and culture of tobacco, with special emphasis on burley. Lecture, 2 hours; lab, 2 hours. Prereq: BOT 101; AGR 206 or consent of instructor. *Staff.*

510 *Ecology and Utilization of Grasslands.* (4) II

Critical study of grassland plants and the biological and physical factors operative in utilization of natural and cultivated grasslands by domestic animals. Lecture, 3 hours; lab 2 hours. Prereq: BIO 201 and 203 or consent of instructor. *T. Taylor.*

512 *Advanced Crops: Cereals.* (3) I

A study of the grain crops of the world in respect to adaptation, culture and uses. Lecture and recitation, 2 hours, lab, 2 hours. Prereq: BOT 101; AGR 206, or consent of instructor. *Finkner.*

730 *Grassland Research.* (3) II

The conduct and interpretation of grassland experiments with emphasis on pasture research and the plant-animal complex. Prereq: Consent of instructor. *Templeton.*

732 *Mineral Nutrition of Plants.* (3) I

Discussion of accumulation, translocation and utilization of mineral elements by higher plants. Emphasis will be placed on the relationships between these processes and plant metabolism. Lecture and discussion, two hours; lab, three hours. Prereq: BOT 701 or BCH 515, or consent of instructor. (Same as BOT 732, HOR 732). *Hiatt.*

734 *Physiology of Growth and Development.* (3) II

A critical evaluation of research in selected aspects of plant growth and development. Emphasis will be on effects of growth environment. Lecture-discussion, three hours. Prereq: BOT 701 or consent of instructor. (Same as BOT 734, HOR 734). *Kasperbauer.*

COURSE IN GENETICS

678 *Statistical Genetics.* (3)

Statistical approaches to the analysis of quantitative inheritance; definition and estimation of genetic parameters relating to selection; inbreeding theory; random-mating and inbred populations; testing and planning in genetic experiments. Prereq: STA 674 and BIO 620 or consent of instructor. (Same as STA 678 and BIO 678.)

COURSES IN BOTANY

(May be used for agronomy credit, subject to the approval of adviser.)

501 *Plant Physiology.* (3-5)

See course description under Botany.

634 *Cytogenetics.* (4)

See course description under Botany.

701 *Plant Metabolism.* (3)
See course description under Botany.

COURSES IN SOIL SCIENCE

562 *Forest Soils.* (3)
The physical, chemical and biological properties of soils as they relate to forest tree growth and the forest community. A study of the genesis, morphology, classification and utilization of soils for forestry. Prereq: AGR 366 and approval of instructor. (Same as FOR 562.)

566 *Soil Biology.* (3) I
The nature and biochemical activities of the soil microflora; their significance in soil genesis and structure and their role in soil fertility. Lecture, two hours; lab, two hours. Prereq: AGR 366, MB 200. *Bloomfield.*

568 *Soil Conservation and Management.* (3) II S
A study of the principles of wise land use and effective soil management with experience in their application. Lecture and discussion, two hours, lab., two hours. Prereq: AGR 366. *Survant.*

570 *Soil Fertility and Fertilizers.* (3) I
Soil reactions of elements essential for plant growth; sources and manufacture of fertilizer materials; effective use of fertilizers and lime in a sound management program. Lecture and discussion, three hours. Prereq: AGR 366 or equiv. *Sims.*

573 *Soil Morphology and Mapping.* (3) I
Study of concepts of soil horizons and soil profiles, and the chemical, physical and mineralogical parameters useful in this characterization. Use of soil survey equipment, preparation of soil maps, and development of a land use plan for an assigned area. Lecture and recitation, two hours; lab, three hours. Prereq: AGR 366; GLY 100 or consent of instructor. *Bailey.*

575 *Soil Physics.* (4) II
Physical properties of soils, with emphasis on soil-water relations, and structure. Lecture and discussion, two hours; lab., four hours. Prereq: AGR 366 and approval of instructor. *Phillips.*

581 *Chemical Analysis of Soils and Plants.* (3) I
Laboratory emphasis on instrumental methods and techniques used in quantitative and qualitative chemical analysis of soil and plant materials and relation of these analyses to physical, chemical and biological systems. Lecture, one hour; lab., six hours. Prereq: CHE 226, AGR 366, or equiv., or approval of instructor.

652 *Soil Classification and Geography.* (3) II
A critical evaluation of the concepts of soil classification, with particular reference to the current U.S. scheme. Study of geographic locations and nature of their soil associations as related to gross consideration of soil genesis. Prereq: AGR 573, AGR 581 or consent of instructor. (Same as GEO 652.) *Bailey.*

660 *Advanced Soil Biology.* (2) II
A critical evaluation of the current research status in selected aspects of soil biology. Prereq: AGR 566 or consent of instructor. *Bloomfield.*

671 *Soil Chemistry.* (3) II
A study of the chemical characteristics of the soil and of the more important chemical processes in the soil. Lecture and discussion, two hours; lab., three hours. Prereq: AGR 570, AGR 581, CHE 442 or consent of instructor. *Thomas.*

675 *Advanced Soil Physics.* (3)
Relation of physical properties of soil to transfer of water, air, plant nutrient ions, and heat in soil and factors affecting such movement. Prereq: AGR 575, 576, MA 214 and consent of instructor.

681 *Mineralogical and Chemical Analysis of Soils.* (odd years) (3) II
Laboratory emphasis on instrumental methods and techniques used in quantitative and qualitative mineralogical analysis of soils and relation of these analyses to physical, chemical and biological systems. Prereq: CHE 226, AGR 366, 581 or equiv. or approval of instructor. *Barnhisel.*

712 *Advanced Soil Fertility.* (even years) (3) I
An integration of the effects of soil, climatic and physiological factors on the nutrition and dry matter accumulation of plants. Lecture and discussion, two hours; lab., two hours. Prereq: AGR 570 or consent of instructor. *Peaslee.*

721 *Soil Genesis.* (odd years) (3) II
Critical study of theories and concepts in soil genesis and their relationships to soil morphology and classification. Analysis of soil properties and soil forming processes responsible for the development of unique soil pedons. Prereq: Consent of instructor. *Bailey.*

736 *Phylogeny of Cultivated Plants.* (3)
Lecture and discussion of concepts and experimental techniques concerned with the origin and phylogeny of cultivated plant species. Lecture, two hours; laboratory, two hours. Prereq: AGR 506, BIO 620 or consent of instructor. (Same as HOR 736.)

741 *Clay Mineralogy.* (odd years) (3) II
A comprehensive study of the crystal structures of clay minerals commonly found in soils and sediments. Prereq: GLY 212, 213; AGR 581, 681, or equiv. or consent of instructor. *Barnhisel.*

ANIMAL SCIENCES

The degrees of Master of Science, Master of Science in Agriculture and Doctor of Philosophy are available with majors in animal sciences. Masters' degrees are awarded under either Plan A or Plan B. Programs in the department are divided into the disciplinary areas of Animal Foods, Animal Nutrition, and Genetics and Physiology. Special interests in beef cattle, dairy cattle, horses, poultry, sheep, swine, meats, animal behavior, dairy technology and dairy microbiology may be pursued within these areas.

Candidates for the Ph.D. degree are required to have a reading knowledge of one modern foreign language and to declare a minor outside the department. On approval of the student's special committee, a minimum of 12 credits in not more than two departments may be substituted for the minor.

400 *Animal Breeding.* (4) I
The application of genetic principles to the improvement of farm animals. Phenotypic and genetic relationships among economic traits as well as modes of inheritance and methods of measuring the traits. The role of inbreeding, outbreeding and selection methods in producing genetically superior population for dairy cattle, poultry, meat animals and horses. Lecture, four hours (Equivalent of ASC 260 may be substituted.) Prereq: ASC 260. *Thrift, et al.*

404 *Sheep Science.* (3) II
History and importance of the sheep industry; selection, breeding, feeding, and management of sheep for lamb and wool production. Lecture, 2 hours. Lab., 2 hours. Prereq: GEN 106 and ASC 280. *Ely.*

406 *Beef Cattle Science.* (3) II
Scope and importance of the beef cattle industry; selection, breeding, feeding, and management of beef cattle. Lecture, 2 hours. Lab., 2 hours. Prereq: ASC 280, GEN 106. *Bradley.*

408 *Swine Science.* (3) I, II
History and importance of the swine industry; selection, breeding, feeding and management of swine. Lecture, 2 hours. Lab., 2 hours. Prereq: ASC 280, GEN 106. *Cromwell.*

410 *Light Horse Science.* (3)
Breed history, development and pedigrees; a general study of the anatomy and physiology of the horse with emphasis on management, nutrition, reproduction and genetics. Diagnosis, prevention and cure of common diseases and ailments; parasite control. Driving, schooling and training. Lecture, two hours; laboratory, two hours. Prereq: ASC 202, GEN 106, ASC 280 or consent of instructor.

420 *Dairy Cattle Science.* (2-3) I
Feeding and management of dairy cattle contributing to profitable production of quality milk. Lecture, 2 hours. Lab., 2 hours. Prereq: ASC 280 and GEN 106, or consent of instructor. *Jacobson, Graden.*

436 *Dairy Processing and Plant Management.* (6) II
Methods used for processing milk, butter, ice cream, cheese, and concentrated milk; fundamentals of dairy plant management. Lecture, 2 hours. Lab., 8 hours. Prereq: ASC 335. *Rudnick, Freeman.*

442 *Poultry Science.* (3) I
Studies of control measures in poultry diseases, nutrition, marketing; flock management and replacement. Lecture, 2 hours. Lab and demonstration, 2 hours. Prereq: GEN 106. *Johnson.*

526 *Reproduction in Dairy Cattle.* (2) II
A study of male and female reproductive processes in dairy cattle and the application of artificial breeding to the improvement of dairy herds. Lecture, 1 hour. Lab., 2 hours. Prereq: GEN 106, ASC 260, ZOO 100 or consent of instructor. *Olds.*

530 *Dairy Microbiology* (4) I
Application of bacteriological principles to production and processing of dairy products, entrance of microorganisms into dairy products, effects of their growth and methods for control. Lecture, 2 hours. Prereq: MB 200 or 400. *Langlois.*

533 *Advanced Animal Food Microbiology.* (3) II
Bacteriological principles and problems relating to specific dairy products and processes. Prereq: ASC 530.

534 *Principles of Dairy Technology.* (4) II
Chemical and physical characteristics of dairy products; chemical, physical and physico-chemical principles involved in dairy processing; special methods of analysis. Lecture, 1 hour. Lab., 6 hours. Prereq: CHE 236, ASC 335. *Freeman.*

548 *Poultry Nutrition.* (3) II
A study of nutrient utilization and requirements for growth and reproduction in Avian species. Lecture, 2 hours. Lab., 2 hours. Prereq: CHE 236 or equivalent, ASC 580. *Begin.*

562 *Advanced Genetics.* (3) II
Concerned chiefly with the physical basis of heredity, mutations, chomosomal aberrations, linkage, genetics and development, and reports on current literature. Lecture, 3 hours. Prereq: ASC 260. *Goodwill.*

564 *Milk Secretion.* (3) II
Anatomy of the mammary gland, physiology and biochemistry of milk secretion and management factors affecting yield and composition of milk. Lecture, 3 hours. Prereq: ASC 280, VS 350. *Van Horn.*

580 *Principles of Animal Nutrition.* (3) I
The chemistry and physiology of animal nutrition and the nutritive requirements for growth, fattening, reproduction, lactation and other body functions. Lecture, 3 hours. Prereq: CHE 236 or equivalent. *Mitchell.*

622 *Current Developments in Dairy Science.* (3) II or S

A course designed to acquaint the advanced student with the more significant problems and scientific developments of current interest in the dairy field. Prereq: Graduate standing and consent of major adviser. *Dairy Science Staff.*

630 *Advanced Meat Science.* (3) I

Advanced meat science with special reference to the histological, chemical, physical and microbiological properties as they relate to meat quality, organoleptic acceptability and processing procedures. Lecture, 2 hours. Lab., 2 hours. Prereq: ASC 304, 306 or equivalent; one course in Histology or Biochemistry or consent of instructor. *Kemp, Moody, Fox.*

660 *Physiology of Reproduction.* (3) II

Physiological processes of reproduction in farm animals; gonadal functions; endocrine relationships; fertility; and factors affecting reproductive efficiency. Lecture, 3 hours. Prereq: ASC 500, VS 501. *Dutt.*

662 *Population Genetics.* (odd years) (3) I

Introduction to principles of static and dynamic populations; statistical concepts and tools applied to quantitative inheritance. Prereq: One course each in statistics and genetics and consent of instructor. *Thrift.*

664 *Advanced Animal Breeding.* (even years) (3) I

Specialized phases of genetics, selection, mating systems and population parameters applicable to synthesis of breeding programs for animal improvement. Prereq: ASC 260, ASC 500 and AEC 530 or equivalents. *Thrift.*

680 *Laboratory Methods in Animal Nutrition and Meats.* (4) I

The use of laboratory techniques and equipment in the solution of fundamental problems of nutrition and meats. Lecture, 1 hour. Lab., 6 hours. Prereq. or concur: ASC 580. *Tucker.*

682 *Nutritient Metabolism.* (5) S

Introduction to history, principles and present concepts of ruminant and non-ruminant mineral nutrition. Prereq: One course in introductory nutrition, physiology or biochemistry and consent of instructor. *Mitchell.*

684 *Advanced Ruminant Nutrition.* (3) II

Introduction to principles of ruminant metabolism in the utilization of feedstuffs for meat, milk and wool production. Prereq: one course in nutrition, physiology or biochemistry and approval of instructor. *Mitchell, Jacobson.*

686 *Swine Nutrition.* (3) I

A study of the nutritional requirements of the non-ruminant animal with special reference to swine and their various stages of growth, lactation and reproduction. An evaluation of the relative value of feed ingredients and mixed feed formulation. Prereq: ASC 580. *Hays.*

688 *Equine Nutrition.* (2)

Detailed study of anatomical, physiological and microbiological factors influencing the nutritive requirements of the equine for maintenance, growth, reproduction, lactation and work. Two class hours per week. Prereq: One course in Nutrition and Physiology or Biochemistry or consent of instructor. *Baker.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

771 *Animal Sciences Seminar.* (1) I, II

May be repeated to a maximum of three credits. *Staff.*

780 *Special Problems in Animal Derived Foods.* (1-4) I, II, S
Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits.

781 *Special Problems in Genetics or Physiology.* (1-4) I, II, S
Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits

782 *Special Problems in Animal Nutrition.* (1-4) I, II, S
Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits

790 *Research in Animal Derived Foods.* (1-6) I, II, S
Problems involving original investigation. Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits.

791 *Research in Genetics or Physiology.* (1-6) I, II, S
Problems involving original investigation. Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits.

792 *Research in Animal Nutrition.* (1-6) I, II, S
Problems involving original investigation. Prereq: Consent of graduate adviser. May be repeated to a maximum of nine credits.

ENTOMOLOGY

The Department of Entomology offers graduate work leading to the Master of Science, Master of Science in Agriculture, and the Doctor of Philosophy degrees. Individual graduate programs are planned by the student in consultation with his adviser and the director of graduate study. Study and research are available in various areas of entomology including applied entomology, behavior, biology control, host plant resistance, insect biology and ecology, insect nutrition, immature insects, medical and veterinary entomology, physiology, taxonomy, toxicology, and acarology. A reading knowledge of only one modern foreign language is required for the Ph.D. degree.

500 *Economic Entomology.* (3) S
For those interested in agricultural teaching and extension work. Life history, control, and means of identification of economic insects of Kentucky are considered. Lecture, 2 hours; lab, 2 hours. Prereq: ENT 100. *Staff.*

530 *Applied Entomology.* (3) II
Principles of insect damage, populations and distributions. Various types of natural and applied control, including problems of insecticide toxicity, resistance, and residues. Lecture, 2 hours; lab, 2 hours. Prereq: ENT 100. *Rodriguez, Thurston.*

532 *Medical Entomology.* (4) I, S
Study of arthropod vectors of disease. Structure, collection, identification, control measures and life history studies. Given alternate years. (Same as ZOO 532.) Prereq: ZOO 534 or consent of instructor. *Knapp.*

534 *Parasitology.* (4) I, S
Protozoan, helminth and arthropod parasites of man and domestic animals, emphasis on etiology, epidemiology, methods of diagnosis, control measures, and life histories. Techniques for host examination and preparation of material for study. (Same as ZOO 534.) Prereq: ZOO 100.

542 *Insect Taxonomy.* (4) I

Methods and principles of systematic entomology and zoology; characteristics of taxonomic categories; and international rules of zoological nomenclature. Collection, preparation and identification of insect specimens. Lecture, 2 hours; lab, 4 hours. (Same as ZOO 542.) Prereq: ENT 100 and ZOO 100. *Freytag.*

595 *Independent Work.* (2-3) I, II, S

Special problems for individual students who are capable of pursuing independent investigations in the various divisions of entomology. Prereq: ENT 100 and any two of the following ENT 530, 532, or 650. *Staff.*

602 *Insect Morphology.* (4) I

A study of internal and external insect structure, including function, and variation of form. Lecture, 2 hours; lab, 4 hours. (Same as ZOO 602.) Prereq: ENT 100 and consent of instructor. *Freytag.*

606 *Insect Toxicology.* (3) II

Toxic action of insecticides: preparation, use, and analysis of insecticides; residues; analytical methods in insect toxicology. Lecture, 2 hours; lab, 2 hours. Prereq: Consent of instructor. *Dorough.*

610 *Insect Ecology and Behavior.* (3)

The biotic and physical factors influencing the distribution, abundance, and behavior of insects and insect populations. Two class hours and two lab hours per week. Prereq: Consent of instructor. (Same as ZOO 610.) *Barr, Thurston.*

620 *General Acarology.* (4) II

Introduction to study of mites. Classification, morphology, physiology and ecology of mites important to the medical, veterinary and agricultural fields. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100, ENT 100 and consent of instructor. (Same as ZOO 620.) *Rodriguez.*

630 *Insect Physiology.* (4) II

Principles of insect physiology, function of organs, circulation, reproduction, respiration, and digestion. Lecture, 2 hours; lab, 4 hours. (Same as ZOO 630.) Prereq: Consent of instructor. *Dahlman.*

650 *Advanced Applied Entomology.* (3) II

Bionomics of insects; representative insecticides, their characteristics, formulation, scope of use, safety factors, and methods of application. Lecture, 2 hours; lab, 2 hours. Prereq: ENT 100 or 500. *Pass.*

660 *Immature Insects.* (4)

Bionomics, structure, and classification of immature stages of insects; practice in their identification. Two class hours, four lab hours per week. Prereq: ZOO 570 or ENT 542, or consent of instructor.

670 *Experimental Methods in Entomology.* (4)

The principles and techniques of instrumentation in entomological research with emphasis on problem selection and the collection, evaluation, and presentation of data. Two class hours and four lab hours per week. *Pass, Dahlman.*

680 *Biological Control of Insects.* (3)

The history and principles of biological control and of integrated programs for insect control. The use of parasites, predators, pathogens, host resistance, electro-magnetic energy, pheromones, and their interactions with insecticide control programs will be discussed. Three class hours per week. Prereq: Consent of instructor. *Thurston.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

780 *Entomological Problems.* (2-3) I, II, S
Investigations of chosen insect problems, including original work. Discussion and assignment of current insect subjects. May be repeated for a maximum of six credits. Prereq: ENT 100, 768. *Staff.*

781 *Entomological Seminar.* (1) I, II
Discussion of current research problems in entomology. May be repeated five times for a total of six hours.

FORESTRY

At present no graduate majors are offered in Forestry.

400 *Wood Identification and Properties.* (3) II
General anatomy of wood, identification of commercial species of the United States based on gross and microscopic features. Properties and uses. Lecture, two hours; lab, two hours. Prereq: FOR 100; BIO 200; and approval of instructor. *Davenport.*

410 *Lumber.* (3) II
The production, processing and merchandising of lumber. *Davenport.*

415 *Wood Seasoning and Preservation.* (2) I, S
Principles and methods involved in air and kiln drying of wood; kiln design and operation. Agencies causing disintegration of wood, factors affecting penetration and absorption of preservative solutions in wood, wood preservatives and processes, plant equipment design and operation, and economic considerations. *Davenport.*

420 *Forest Products.* (3)
Sources, processing and utilization of forest products other than lumber.

425 *Forest Photogrammetry.* (3)
Use of aerial photographs in land and topographic mapping, forest type delineation. Lecture, two hours; laboratory, two hours. Prereq: FOR 300 and 310.

562 *Forest Soils.* (3)
The physical, chemical and biological properties of soils as they relate to forest tree growth and the forest community. A study of the genesis, morphology, classification and utilization of soils for forestry. Prereq: AGR 366 and approval of instructor. (Same as AGR 562.)

780 *Special Problems in Forestry.* (1 to 4) I, II, S
This course is designed to meet the need for advanced work. Prereq: FOR 400, 415 and approval of instructor. May be repeated to a maximum of nine credits. (The department has special competence in providing opportunity for study in the Wood Science and Technology area.) *Staff.*

GENERAL AGRICULTURE

501 *Agency Relationships.* (1)
Objectives of public and private agricultural agencies and organizations and how they cooperate to improve agriculture.

HORTICULTURE

The Department of Horticulture offers work leading to the degree of Master of Science in Agriculture. Study and research may be concentrated in any one of the specialized fields of Pomology, Vegetable Crops, Floriculture, Ornamentals, or Landscape Horticulture, and should relate to problems in such areas as genetics, plant physiology, landscape design, etc.

The Department of Horticulture is a participant in the interdepartmental Doctor of Philosophy degree programs in the area of plant physiology. Members of the department are particularly well qualified to supervise research of graduate students in this area, and the department has graduate assistantships available to support qualified graduate students in such program.

500 *Methods of Pest Control in Horticultural Crops.* (2) I

A study of the principles and practices of spraying for the control of pests of horticultural crops including insects, diseases and weeds. Lecture, one hour, Lab, 2 hours. Prereq: One semester of Entomology, and consent of instructor.

502 *Pomology: Deciduous Tree Fruits.* (3) I

A course dealing with the theory and practice of commercial tree fruit production, with major emphasis on apple growing. Lecture, two hours; Lab., two hours. *Lockard.*

504 *Pomology: Small Fruits.* (2) II

A detailed study of the care and management of commercial plantings of strawberries, raspberries, and other bush fruits. Lecture, one hour, laboratory, two hours, first half of course. Lecture, 2 hours, last half of course. *Chaplin.*

506 *Greenhouse Design, Management and Environmental Control.* (3)

Functional requirements of a greenhouse and the physical laws influencing these requirements. The influence of structural, physical, and biological factors on the environmental conditions will be emphasized. Prereq: HOR 512, AEN 100, or consent of instructor. (Same as AEN 506.) *Knavel, Walker.*

510 *Vegetable Crops.* (3)

A study of the fundamental principles underlying commercial production of vegetables. Lecture, two hours; lab, two hours. Prereq: AGR 366. *Fogleman.*

512 *Greenhouse Vegetable Crops.* (3) II

Principles of vegetable crop production in environmentally controlled growing structures; methods for controlling the environment; vegetable crops adapted to greenhouse production. Lecture, two hours; laboratory, two hours. *Knavel.*

515 *Turf Management.* (3) I

Types of grasses used for turf; basic and applied principles of turf culture as they relate to the various phases of turf industry, i.e., Ornamental Horticulture, Landscaping, Sod nurseries, golf courses, and athletic fields, parks and highways. Lecture, two hours; laboratory, two hours. Prereq: One course in Botany and one in Soil Science. *Stoltz.*

522 *Landscape Planting Design.* (3) II

A detailed study of the use of various plant materials to express the principles of landscape design. Lecture, two hours; laboratory, two hours. Prereq: HOR 331, 527.

524 *Floriculture II.* (3) II

A detailed study of specific groups of florists' crops, with particular reference to methods of control of flowering and growth. Lecture, two hours; laboratory, three hours. Prereq: HOR 335.

525 *Plant Propagation.* (3) II
A detailed study of the methods of propagating certain horticultural plants. Includes cuttings, grafting, and budding. Lecture, two hours; laboratory, two hours. Prereq: HOR 331, BOT 101, 103. *Stoltz.*

732 *Mineral Nutrition of Plants.* (3)
Discussion of accumulation, translocation, and utilization of mineral elements by higher plants. Emphasis will be placed on the relationship between these processes and plant metabolism. Prereq: BOT 701 or BCH 515 or consent of instructor. (Same as BOT 732, AGR 732.)

734 *Mineral Nutrition of Plants.* (3)
Discussion of accumulation, translocation, and utilization of mineral elements by higher plants. Emphasis will be placed on the relationship between these processes and plant metabolism. Prereq: BOT 701 or consent of instructor. (Same as BOT 734, AGR 734.)

736 *Phylogeny of Cultivated Plants.* (3)
Lecture and discussion of concepts and experimental techniques concerned with the origin and phylogeny of cultivated plant species. Lecture, two hours; laboratory, two hours per week. Prereq: AGR 506, BIO 620 or consent of instructor. (Same as AGR 736.)

768 *Residence Credit for Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits.

770 *Seminar.* (1) I, II, S
May be repeated to a maximum of three credits. *Staff.*

782 *Special Problems in Horticulture.* (1-4) I, II, S
This course is designed to meet the need for advanced work. Prereq: Approval of instructor. May be repeated to a maximum of twelve credits. *Staff.*

790 *Research in Horticulture.* (1-4) I, II, S
Prereq: Approval of instructor. May be repeated to a maximum of nine credits. *Staff.*

PLANT PATHOLOGY

In the Department of Plant Pathology professors and graduate students are engaged in studies in several areas, with emphasis on fungus, virus, and nematode diseases.

Aspects of fungus diseases being studied include pathotoxins, mycotoxins, fungal lipids, morphogenesis of pathogens, genetics of pathogens, ecology of root pathogens, genetics of host resistance, and cytological and physiological changes in infected plants.

Early events in virus infection, virus-vector relationships, inhibition of virus infection, influence of environmental factors, genetics of host response, and other cytological and physiological changes in virus-infected plants are being studied.

Active programs exist in three additional areas: nematology, fungicides, and development of disease-resistant plants.

Infection by plant parasitic nematodes, reproduction and development of nematode populations, inter-relationships among species of plant parasitic nematodes, and variability within a species of nematodes are being studied. Mechanisms of fungicidal action and the metabolic fate of fungicides are being

investigated. Disease-resistant plants are being sought, identified, and selected in populations of tobacco, corn, and forage legumes and grasses; disease-resistant plants are being developed in cooperation with faculty members in the Departments of Agronomy and Horticulture.

Special instruments within the department include the following: centrifuges, ultra-centrifuges, spectrophotometers, electron microscope, microtomes, analytical balance, liquid scintillation counter, analytical ultra centrifuge, autoclaves and sterilizing equipment, autoanalyzers, Clark oxygen electrode apparatus, counter-current distribution apparatus, electrophoresis apparatus, fluorometer, freeze-dry apparatus, gas chromatographs, incubators, Geiger-Meuller counters, micro-manipulators, chromatography equipment, particle counter, phase microscopes, microscopes, pH meters, respirometers, tissue culture facilities, photomicrography and darkroom facilities.

M.S. and Ph.D. degrees are offered. For the Ph.D. degree, in addition to the requirements established by the Graduate School, the Department requires mathematics through integral calculus, two semesters of physics, organic chemistry and introductory courses or equivalent in botany, microbiology, entomology and soils. Proficiency in one foreign language is required, normally German, French, or Russian. A formal minor is not required.

541 *Plant Pathology.* (3) I, II

Significance, nature, causes, and methods of control of plant diseases. Lecture and discussion, 2 hours; lab, two hours. Same as BOT 541. Prereq: BOT 101 or 125 or consent of instructor. *Chapman, Diachun.*

543 *Diseases of Plants.* (3) S

Symptoms, causes, and control of some of the more common representative plant diseases. Students may select disease problems in their major field of interest. Discussion, 1 hour; lab, 4 hours. Prereq: PPA 541 or BOT 541 or equivalent and consent of instructor. *Staff.*

656 *Virus Diseases of Plants.* (4) II

Characteristics and properties of viruses that cause plant diseases; host-virus relationships; identification and control of some important virus diseases; consideration of research methods. Lecture and discussion, 2 hours; lab, 4 hours. Prereq: PPA 541 or BOT 541 or consent of instructor. *Diachun, Pirone, Shaw.*

658 *Nematode Diseases of Plants.* (odd years) (3) I

The importance, effects, recognition and control of nematodes that cause plant diseases; physiology of plant parasitic nematodes and their relations with other nematodes and plant pathogens. Lecture, 1 hour; lab, 4 hours. Prereq: PPA 541 or BOT 541; ZOO 534; or consent of instructor. *Chapman, Williams.*

660 *Physiology of Plant Diseases.* (3) I

Lectures, discussions, and independent reading on biochemical and physiological aspects of plant disease and of disease resistance and immunity in plants. Lecture, 3 hours. Prereq: PPA 541, and BCH 511 or BOT 701. *Hampton, Wheeler.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

770 *Plant Pathology Seminar.* (1)
Reports and discussion of problems and investigations of problems in plant pathology. May be repeated for a maximum of four credits. *Staff.*

784 *Special Problems in Plant Pathology.* (1-3) I, II, S
Prereq: PPA 541 or BOT 541 or equivalent or consent of instructor. May be repeated to a maximum of nine credits. *Staff.*

794 *Research in Plant Pathology.* (1-4) I, II, S
Prereq: PPA 541 or BOT 541 or consent of instructor.
May be repeated to a maximum of twelve credits. *Staff.*

PLANT PHYSIOLOGY

The interdepartmental doctoral program in Plant Physiology is described on page 75.

RURAL SOCIOLOGY

For description of degrees and activities, see Sociology, p. 159

VETERINARY SCIENCE

The Department of Veterinary Science offers a program leading to the doctor of philosophy degree with majors in general pathology, veterinary microbiology, veterinary parasitology and nutritional pathology. Development of research competency and attainment of scholarly maturity in the bio-medical sciences are the general objectives. The program is designed primarily for students possessing the Doctor of Veterinary Medicine degree. Individuals electing general or nutritional pathology as major areas must be graduate veterinarians. Candidates with a Master of Science in microbiology or parasitology and choosing either of these as major areas may be admitted with faculty approval. Individual programs of study leading to this degree must conform with the general rules and regulations of the Graduate School, except that a reading knowledge of one modern foreign language is required for the Ph.D. degree.

769 *Residence Credit for Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Veterinary Science Seminar.* (1) I, II
Required of graduate students in Veterinary Science. May be repeated for a maximum of six credits. Prereq: Permission of staff.

781 *Correlative Pathology.* (1-3) I, II, S
Supervised experience in the use of clinical, gross and histopathological techniques in the differential and definitive diagnosis of diseases. Prereq: Pathology in D.V.M. curriculum or equivalent and permission of staff. May be repeated for a total of 9 credits.

782 *Nutritional Pathology.* (3) II
The pathogenesis and physiopathology of deficiency states in domestic and laboratory animals. Alternate years. Pathology in D.V.M. curriculum or equivalent and approval of staff.

783 *Infectious Diseases of Domestic Animals.* (3) II

Etiology, pathogenesis, epizootiology, prophylaxis and therapy of selected infectious diseases of domestic animals. Alternate years. Prereq: Microbiology and pathology in D.V.M. curriculum or equivalent and approval of staff.

784 *Advanced Veterinary Immunology.* (2) I

Theory and practice of the development and standardization of vaccines, and the evaluation of their potency, safety and efficacy in the prophylaxis of infectious diseases of domestic animals. Alternate years. Prereq: Microbiology in D.V.M. curriculum or equivalent and approval of staff.

785 *Advanced Veterinary Parasitology.* (3) I

Experimental methodology and host parasite relationships of the protozoan and helminth parasites of domestic animals. Alternate years. Prereq: Parasitology in D.V.M. curriculum or equivalent and approval of staff.

786, 787 *Advanced Veterinary Pathology.* (3 each) I, II

Specialized instruction in techniques and interpretations of pathology and pathologic anatomy. Emphasis will be upon evaluation of lesions for understanding the pathogenesis of disease processes in the living animal. Alternate years. Prereq: Pathology in D.V.M. curriculum or equivalent and approval of staff.

791 *Research in Veterinary Microbiology.* (1-9) I, II, S

Independent research in veterinary microbiology. Prereq: Permission of staff. May be repeated for a total of 24 credits.

792 *Research in General Veterinary Pathology.* (1-9) I, II, S

Independent research in veterinary pathology. Prereq: Permission of staff. May be repeated for a total of 24 credits.

793 *Research in Veterinary Parasitology.* (1-9) I, II, S

Independent resarch in veterinary parasitology. Prereq: Permission of staff. May be repeated for a total of 24 credits.

794 *Research in Nutritional Pathology.* (1-9) I, II, S

Independent research in veterinary pathology. Prereq: Permission of staff. May be repeated for a total of 24 credits.

II. ARTS AND SCIENCES

ANTHROPOLOGY

The Department of Anthropology offers courses and research options leading to the Ph.D. degree in the special areas of Ethnology, Culture History (Ethnohistory and Archaeology), and Applied Social Anthropology. The department also offers the M.A., a general degree certifying a broad background in anthropology, plus research competence in the collection and processing of primary data.

All incoming graduate students without the M.A. are treated initially as candidates for this degree, and are expected to take the M.A. comprehensive examination. Students who pass this examination with a high score, and who demonstrate satisfactory research competence, may petition to by-pass the master's thesis. A reading knowledge of one modern foreign language is required for the M.A. degree in anthropology, and a reading knowledge of two is required for the Ph.D.

The following areas are represented in the individual research experience of the anthropology faculty: Southeast Asia, Latin America, Oceania, North Africa, Europe, and North America, including strong competence in rural English-speaking subcultures.

The department participates in interdisciplinary research in the University's Center for Developmental Change and in the Water Resources Institute. The Department of Behavioral Science, College of Medicine, includes anthropologists on its staff, and students with interests in medical anthropology are encouraged to take the behavioral science concentration. Anthropology graduate students with appropriate interests are eligible for assistantships in the above fields.

Department standards for admission to graduate work in anthropology are similar to those of the Graduate School, including satisfactory scores on the verbal and quantitative tests of the Graduate Record Examination. Contact the Chairman, Department of Anthropology, for additional information on departmental requirements and opportunities for financial assistance.

402 *Human Identification.* (2)

This course requires of the student a detailed and systematic knowledge of human anatomy, both of the skeleton and the soft part tissues. The first half of the course will be devoted to the positive identification of all the bones of the human skeleton. This approach involves knowing each bone and its fragments, including the identification by side (left or right). In addition, sex differences and age changes will be mastered as the student's knowledge increases. And, finally, the student will be expected to determine the racial origins of skeletal remains from such skull features as the nose, palate, and its teeth, the chin and long bone proportions. Lecture, one hour; lab, 2 hours. *Robbins.*

428 *Contemporary Cultures and Societies in Southeast Asia.* (3)

A descriptive and analytical consideration of representative cultures from insular and mainland Southeast Asia in terms of their social, political, economic and religious organization. The history of the cultural contracts of Southeast Asia with India, China, Europe and the Islamic tradition will be discussed. Prereq: ANT 120, 121 or consent of instructor.

438 *Ethnology of the Near East and North Africa.* (3)
Survey of Islamic, Christian, and Hebraic cultures of the Near East and North Africa, with emphasis on relations between religious traditions and political systems. Prereq: ANT 120 and 121, or consent of instructor. *Adams.*

439 *Circumpolar Peoples.* (3)
Ethnology of Old World and New World peoples of the circumpolar region, with emphasis on its common characteristics. Prehistoric connections between Eurasia and America and historic developments in both will be considered. Three class hours per week. Prereq: ANT 121 or consent of instructor. *Lantis.*

442 *New World Prehistory.* (3)
Survey of the origin and growth of prehistoric American Indian cultures as revealed by archaeological data. Prereq: ANT 120, 121. *Drucker.*

490 *Pre-Field Study Seminar.* (3)
Orients students in a specified cultural area where they will conduct field research under faculty supervision and provides training in designing anthropological research. Prereq: ANT 120, 121, major, and consent of instructor.

500 *Physical Anthropology.* (4)
Lecture-laboratory course on the biological nature of man. The fields of the primates, fossil man, races, race mixture, constitutional anthropology and human growth with supplementary laboratory exercises will be covered. Prereq: ANT 120 or three hours in any other Bio. Science. *Robbins.*

510 *History of Anthropological Theory.* (3)
Description and analysis of significant anthropological ideas in their historical context; the growth of the theoretical concepts in physical anthropology, archaeology, and ethnology. *Bacdayan or Adams.*

512 *Comparative Civilizations.* (3)
Comparison of complex societies of the past and present, stressing similarities and differences in their historical development and culture achievements. Three class hours per week. *Adams.*

514 *Descriptive Linguistics: Phonetics.* (3)
Articulatory description of speech sounds; practice in recognition and control. (Same as ENG 514.) Prereq: consent of instructor. *Faust.*

515 *Descriptive Linguistics: Phonemics.* (3)
An investigation of speech-sounds and systems of speech-sounds. Also attention to both speech and writing as communication systems. (Same as ENG 515.) *Faust.*

516 *Descriptive Linguistics: Morphemics.* (3)
An explanation of some of the ways speech-sounds are put together in patterns so as to form languages. (Same as ENG 516). Prereq: consent of instructor. *Faust.*

521 *Ethnology of the New World.* (3)
Cultures and physical types of the American Indians during and after white settlement. (Northwestern North America is not included.) Prereq: ANT 241 or equivalent course on Near East. *Essene.*

522 *North Pacific Coast Cultures.* (3)
Ethnology of the Maritime peoples of Western North America and Northeast Asia. Cultural connections between America and Asia will be stressed. Prereq: ANT 121. *Essene, Drucker.*

523 *Ethnology of Oceania.* (3)
A survey of the various cultures on the islands of the Pacific. Both aboriginal and modern acculturated societies will be considered. Prereq: ANT 120, 121. *Essene, Drucker.*

524 *Mythology.* (3)
The unwritten literature of primitive peoples: themes, diffusion, style, literary devices, and function of myths. *Essene.*

525 *Applied Anthropology.* (3)
Application of anthropological methods to contemporary practical problems such as acculturation, colonial administration, intercultural education, and race relations. Prereq: ANT 121. *Gallaher.*

526 *Culture and Personality.* (3)
The cultural basis of personality. Personal character considered as the result of culturally fostered patterns. The ideal personality in several selected societies. Three class hours per week. Prereq: SOC 101. (Same as SOC 526.) *Hochstrasser, Robbins, Lantis.*

527 *Culture Change.* (3) I
Internal change and contact change in cultures; agents and conditions promoting change; an analysis of innovation, dissemination, integration, diffusion, acculturation, and related concepts. Prereq: ANT 121. *Gallaher.*

530 *Contemporary Latin American Cultures.* (3) I
Detailed survey of societies and cultures of contemporary Latin America, utilizing contributions from anthropological research. Prereq: Consent of instructor. *Dobyns.*

533 *Social Anthropology.* (3) II
History and theory of social anthropology with special emphasis on the comparative approach to analysis of structure, function, and change in social and cultural systems. Prereq: SOC 101; consent of instructor. (Same as SOC 533.) *Dobyns, Bacdayan.*

536 *European Peasantries.* (3)
Comparison of peasant populations and their modernization, with emphasis upon the dynamics of cultural stability and change encountered in relationships between national elites and peasantries in various countries. Prereq: ANT 510; Junior classification. *Gallaher.*

541 *Archaeological Theory and Methods.* (3)
The concepts and aims of archaeology, its history as a scientific discipline, and its present role in the social sciences. Attention to basic principles in field work, and to recent advances. *Drucker.*

542 *North American Archaeology.* (3)
Origin and growth of prehistoric American Indian cultures north of Mexico as revealed by archaeological data. *Drucker.*

546 *Prehistoric Meso-America and Peru.* (3)
An intensive study of the native American civilizations: their origins, development and achievements. Three class hours per week. *Drucker.*

547 *Cultures of the Southwestern United States.* (3)
Development of sedentary and nomadic Indian peoples, from earliest times to the present. Emphasis on Puebloan, Mogollon, and Hohokam archaeology and continuity with modern Indians. *Adams, Dobyns.*

548 *European and Near Eastern Archaeology.* (3)
Prehistoric cultural development in Europe and the Near East, from the earliest times to the beginning of civilization. Prereq: ANT 120 and 121, or consent of instructor. *Adams.*

550 *Field Studies in Anthropology.* (1-6)
Field research as part of a long-range anthropological research program. Provides student with an initial experience conducting research under faculty supervision. May be repeated for a maximum of 12 credits. Prereq: At least one semester of the appropriate language of the area of research, and consent of instructor, in addition to ANT 120, 121.

555 *Eastern North American Archaeology.* (3)
Detailed analysis of prehistoric cultures of eastern United States with emphasis on interpretation of prehistory of Ohio River Valley. Prereq: ANT 120, 121, and 442 or consent of instructor.

560 *Ethnographic Principles and Practice.* (3)
Exposition of the principles of ethnographic data collection, and practice in the acquisition and use of censuses, genealogies, personal histories, maps, specialized recordings, specimen collections, and other materials. Three class hours per week. Prereq: ANT 510. *Lantis, Dobyns.*

561 *Anthropology: Man and His Works.* (3)
Survey of the major fields of anthropology: physical, prehistory, and ethnology and a guide to source material. Designed for students not contemplating further work in anthropology. *Staff.*

575 *Prehistory of Eastern Asia.* (3)
Prehistoric cultures of the East Asian mainland from the Old Stone Age to the beginnings of Chinese civilization, and their diffusion to Japan, Australia, and Oceania. Prereq: ANT 120 and 121, or consent of instructor. *Adams.*

581 *Independent Work in Anthropology.* (1-4)
May be repeated to a maximum of 12 credits. Prereq: Major and standing of 3.0 in department. *Staff.*

582 *Tutorial Seminar.* (2)
Anthropological methods and theory.
May be repeated to a maximum of eight credits. Prereq: Major in Anthropology. *Staff.*

585 *Field Laboratory in Archaeological Research.* (3-6)
Practical supervised training in field in archaeological research methods and techniques, problem analysis, field laboratory procedures, recording methods. May be repeated for a maximum of 12 credits. Prereq: ANT 541 and consent of instructor.

601 *Proseminar in Anthropology.* (4)
Survey of contemporary anthropology and its constituent subfields, with emphasis upon its core concepts. Four class hours per week. Prereq: Graduate standing. *Staff.*

602 *Contemporary Anthropological Theory Seminar.* (3)
Systematic survey of significant theories current in anthropology, the primary concepts employed, and important contributors to anthropological theory. Emphasizes distinctive characteristics of the discipline. Three class hours per week. Prereq: ANT 601. *Dobyns.*

610 *History of Anthropology.* (3)
Traces the development of anthropology in historical perspective, with particular attention to major theorists. Three class hours per week. Prereq: ANT 601 or consent of instructor. *Bacdayan.*

614 *Field Methods in Linguistics.* (3)
Analysis of a language by working directly with a native speaker. Prereq: ANT (ENG) 514 or 515 and ANT (ENG) 516. *Faust.*

641 *Middle and South America Seminar.* (3)
Current trends in change and modernization in Latin America. Deals with social, economic, ideological and political aspects of contemporary Latin American culture. Prereq: ANT 601, or consent of instructor. *Dobyns.*

648 *Seminar on Southeast Asian Cultures and Societies.* (3)
A seminar in Southeast Asian culture and societies with emphasis on the contemporary political, economic, religious and social scene. Particular emphasis will be placed upon the exploration and understanding of current problems in the region through consideration of its prehistory, physical habitats, and the influences of the Hindu, Chinese, Islamic and European cultures. Prereq: ANT 428, GEO 552 or consent of instructor, in addition to ANT 601.

658 *Seminar on African Societies.* (3)
Analysis of differing sociocultural factors in sub-Saharan Africa and their influence upon patterns of modernization, nationalism, and changing tribal structures. Prereq: ANT 601; ANT 431 or consent of instructor.

661 *Seminar on Near Eastern Cultures.* (3)
Analysis of social and cultural factors resulting in differing patterns of change, modernization, nationalism in Islamic countries and Israel. Prereq: ANT 601; ANT 438 or consent of instructor. *Adams.*

670 *Seminar on Role Theory.* (3)
An exploration of differences and similarities in the utilization of the concept of role in Sociology, Anthropology and Psychology. Emphasis is placed on the potentiality of role as a unifying concept in the behavioral sciences. Three class hours per week. (Same as BSC 670; SOC 670.) Prereq: SOC 101. *Gallaher.*

690 *Advanced Pre-Field Study Seminar.* (3)
Orients graduate students on a specific cultural area where they will conduct research under faculty supervision; provides training in anthropological research design. Prereq: ANT 601, requisite language skills, and consent of instructor.

727 *Seminar on Socio-Cultural Change.* (3)
A seminar for advanced students. Emphasizes economic, religious, political, technological, psychological, etc. factors in change, and social and cultural patterns and processes of change. Prereq: SOC 101, ANT 527 or SOC 518, or permission of instructor. (Same as SOC 727.)

730 *Seminar in Comparative Religious Systems.* (3)
A seminar on principles in the comparative study of religious behavior and religious institutions and principles of change in religion as a cultural form. Deals mainly with religions of non-literate peoples. Three class hours per week. Prereq: Consent of instructor. *Lantis.*

731 *Seminar in Comparative Social Organization.* (2) II
A seminar for advanced students. Emphasizes principles in the comparative study of social systems; the role of kinship, age, sex, locality, and voluntary associations in determining relationships between individuals and between groups in non-literate and literate societies. (Same as SOC 731.) May be repeated once. Prereq: SOC 101. *Gallaher, Bacdayan.*

750 *Graduate Field Study in Anthropology.* (1-6)
Field research as part of a long-range anthropological research program for graduate interns training under direct faculty supervision. Provides student with experience conducting scientific research as research team member. Report required. Prereq: Appropriate language fluency; preparatory area study plus consent of instructor in addition to ANT 601.

765 *Research Problems in Medical Anthropology.* (3)
(1) History and theory of medical anthropology; (2) research design, field work, analysis of data, and report writing. Prereq: Graduate status in Anthropology, Sociology, or Psychology, *and* a Concentration or minor in Medical Behavioral Science. Two class hours, 3 lab hours per week. (Same as BSC 765.) *Pearsall.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Seminar.* (2)
Intensive work in particular fields of anthropology. All students during a given semester will be assigned related phases of the same problem. Designed primarily for students working toward a master's degree in Anthropology. May be repeated once. *Staff.*

790 *Research Problems in Anthropology.* (3)
Intensive study in the fields of Physical Anthropology, Archaeology, and Ethnology with qualified staff members. Term papers required. May be repeated three times. *Staff.*

ART

The Department of Art requires as prerequisite to the Master's Degree undergraduate work equivalent to that offered in the Department for its art majors. Work toward the Master's Degree may be undertaken in ~~three~~ areas: ~~(1) creative work in studio~~, (1) art history and criticism, (2) art education.

For admission to the program in creative work the student must present an acceptable portfolio of work (slides or photographs). The Master's Degree will be given under Plan B (see page 23) on the satisfactory completion of 24 hours in studio work and 6 hours of art history, a Master's Exhibition approved by a Departmental committee, and the submission of a photographic record of the Exhibition in approved form.

Students admitted to the program in Art History are expected to have completed course work equivalent to an undergraduate major in art history. Work toward the Master's Degree is undertaken under Plan A (see page 22), with a total of 24 hours work, completion of the thesis and the language requirement. It is required that the student offer either course work or substantial proof of ability to use more than one foreign language.

The program for the Master's Degree in Art Education, is undertaken under Plan A, with a thesis based on substantial research, or theory in art education. No courses required for certification in a 48-hour area of concentration may be admitted as course work relevant to the Master's Degree in Art Education.

STUDIO COURSES

A-S 502 *Advanced Drawing.* (3)
Introduction and exploration into experimental materials and media. Relation of traditional and contemporary drawing attitudes to other areas investigated. Independent projects encouraged. Nine studio hours per week. Prereq: A-S 302. *Mock.*

A-S 510 *Advanced Painting.* (3) I, II, S
Individual development in creative painting. Nine studio hours per week. May be repeated to a maximum of 9 credits. Prereq: A-S 311. *Suzuki.*

A-S 525 *Advanced Printmaking.* (3) I, II, S
Individual development in creative printmaking. Media and procedures within the general areas of lithography, intaglio, relief, and serigraphy will be chosen or devised as a means of creative expression, and/or new processes of printmaking will be devised. Nine studio hours per week. May be repeated to a maximum of 9 credits. Prereq: A-S 320, A-S 325. *Jones.*

A-S 540 *Textiles: Advanced Weaving.* (3) I or II
Woven and non-woven techniques combined in creating fabrics in relation to architectural demands. Aesthetic exploration in depth of materials, color and texture. Nine studio hours per week. Prereq: A-S 340, A-S 342. *Green.*

A-S 555 *Advanced Casting.* (3) I or II
Furthering of technical competence with the introduction of bronze alloying. Development of a professional and personal point of view toward cast sculpture will be stressed. Independent projects of architectural scale will be encouraged. Nine studio hours per week. Prereq: A-S 356. *Hall.*

A-S 560 *Advanced Welding.* (3) alt. yr.
All types of welding in all metals. A course for the expert welder, showing great promise as a sculptor. Personal, individual directions encouraged with professional quality work expected. Nine studio hours per week. Prereq: A-S 255, 360, 361. *Hall.*

A-S 565 *Advanced Wood Sculpture.* (3) I or II
Independent projects at professional level expected. Combination of wood and other materials to be investigated. New industrial products and methods will be utilized. Nine studio hours per week. Prereq: A-S 366. *Johnson.*

A-S 570 *Theory of Glazes and Refractories.* (3) alt. yr.
Theory and application in calculation of low and high fire glazes and clay bodies. Studying the properties of raw materials, and exploring the possibilities of various firing ranges. Original development of clay and glazes is encouraged and results analyzed. Nine studio hours per week. Prereq: A-S 371. *Tuska.*

A-S 571 *Advanced Problems in Ceramics.* (3) alt. yr.
In addition to doing advanced wheel problems, students concentrate on the creation of "new" functional forms and the problems of one-man production methods. Personal development of clay and glazes is encouraged. Nine studio hours per week. May be repeated to a maximum of 9 credits. Prereq: A-S 570. *Tuska.*

A-S 595 *Independent Work: Painting, Printmaking.* (3) I, II, S
Individual work in drawing, painting, and printmaking. May be repeated for a maximum of 9 credits. Prereq: Major and standing of 3.0 in the Department. *Suzuki.*

A-S 596 *Workshop.* (1-6) S
Summer workshops in sculpture or ceramics dealing with advanced problems. Three studio hours per credit. Prereq: Consent of instructor. *Staff.*

A-S 597 *Independent Work: Advanced Sculpture and Other Three Dimensional Media.* (3) I, II
Individual research and experimental work. May be repeated for a maximum of 9 credits. Prereq: Major and 3.0 standing in the department; any course in the 330 sequence and the consent of the instructor. *Staff.*

A-S 610 *Traditional and Experimental Media in Painting.* (3) I, II, S
A survey of historical and contemporary procedures and materials with sustained problems in mural and easel painting. Preparation of grounds and consideration of permanency in pigments, vehicles and supports. Prereq: 3 credits in advanced painting, consent of the instructor. *Suzuki.*

A-S 798 *Problems in Sculpture, Ceramics and Design.* (3) I, II, S
Sustained individual problems and experimental work in the technical and theoretical problems of design. May be repeated for a maximum of 9 credits. Prereq: 12 credits in upper division studio work and consent of the instructor. *Hall.*

A-S 799 *Problems in Painting and Printmaking.* (3) I, II, S
Sustained individual problems in drawing, painting, and printmaking. May be repeated for a maximum of 9 credits. Prereq: 12 credits in upper division studio work and consent of the instructor. *Staff.*

ART HISTORY COURSES

A-H 505 *Roman Art: 5th Century BC to 4th Century AD.* (3) alt. yr.
Painting, sculpture, and architecture of the Roman Empire from the Etruscans through the Age of Constantine. Three class hours per week. Prereq: A-H 200, 201, 300.

A-H 506 *Greek Art.* (3) alt. yr.
The development of architecture, sculpture, painting and minor arts of Classical Greece. Greece from its beginning to the end of the Hellenistic period. Three class hours per week. Prereq: A-H 200, or consent of the department.

A-H 530 *Medieval Art of Italy and Sicily.* (3) alt. yr.
While emphasizing the architectural developments and the mural and mosaic decoration, much attention given to the small scale major arts of stone and metal sculpture, ivory carving, gold and enamel work and manuscript illumination from the 4th to the 14th centuries. Three class hours per week. Prereq: A-H 334. *Freeman.*

A-H 550 *Italian Renaissance Painting:* 1350-1550. (3) alt. yr.
Painting in Italy from the time of Giotto and Duccio to Mannerism. Painting in Tuscany, Umbria, Rome, and the creation of Venetian painting and the spread of Mannerist tendencies. Three class hours per week. *Amyx.*

A-H 551 *Italian Renaissance Architecture: 15th and 16th Centuries.* (3) alt. yr.
The history of architecture in Italy from Brunnelleschi to Palladio. Three class hours per week. Prereq: A-H 201, 355 or consent of the instructor.

A-H 555 *Italian Renaissance Sculpture.* (3) alt. yr.
A concentrated study of Renaissance Sculpture in Italy from 1400 to 1600; from the beginnings of the "new humanism" to Michelangelo, tracing the philosophical, social, artistic and historical influences upon the major sculptors of this era. Three class hours per week. Prereq: A-H 201, 355 or consent of the instructor.

A-H 565 *Roman Baroque Art.* (3) alt. yr.
The arts in Rome from the beginning of the 17th through early 18th centuries; the diffusion of Roman Baroque forms in Central and Northern Italy. Three hours per week. Prereq: Either A-H 355 or 365 or permission of instructor. *Amyx.*

A-H 570 *19th Century Architecture: Neo-Classicism to the Chicago School.* (3) alt. yr.
European and American architecture from Ledoux to Louis Sullivan. Three class hours per week. Prereq: A-H 201, 370 or consent of instructor. *Sandvik.*

A-H 576 *Art in America.* (2) II
A survey of American architecture, sculpture, painting, illustration, handicrafts, industrial design, etc., from colonial times to the present. *Amyx.*

A-H 580 *French Painting: 19th Century.* (3) alt. yr.
The history of French painting from David to Cézanne. Three class hours per week. *Sandvik.* Prereq: A-H 201, A-H 370 or permission of instructor.

A-H 590 *The History of Western Graphic Arts.* (3) alt. yr.
The origin in the 15th century and the subsequent developments in the Relief and Intaglio methods of printmaking, principally in Italy, Germany, and the Netherlands; the significant artists contributing to the extension of the medium as a fine art with the highest creative possibilities; the later invention and various developments in the Planographic method. Three class hours per week. Prereq: A-H 201 and two of the following: A-H 350, 355, 365, 370. *Freeman.*

A-H 591 *Seminar in Art History.* (2) I
An intensive study of a particular medium, area, period, or style in art history, with special emphasis on interpretation of sources, and the handling of visual and bibliographical materials. Required of majors in the History of Art. Required for all candidates for M.A. Degree in Art History. Two class hours per week. Prereq: Two courses in art history at 300 level. *Amyx.*

A-H 592 *Aesthetics.* (3) II
Problems of method in aesthetics; major types of aesthetic theory. Aesthetic materials of the arts, in literature, music, and the space arts. Form and types of form. Meaning in the arts. Interrelations of the arts. (Same as PHI 592.) *Amyx.*

A-H 593 *Seminar in Art.* (1) I, II
Current problems in art; correlations of theory and practice; discussions and reports. For seniors and graduates majoring in art. The seminar is prerequisite to the comprehensive examination. May be repeated to a maximum of 4 credits. *Staff.*

A-H 594 *Criticism of Art.* (3) I
History and theory of criticism in the Visual Arts. A survey of major types of critical theory, historical and contemporary. Required of majors in art history; open to majors in philosophy, literature, and the arts. *Amyx.*

A-H 599 *Independent Work: Art History.* (3) I, II, S
Individual research: history, criticism, aesthetics. Prereq: Major and standing of 3.0 in the department. May be repeated for a maximum of nine credits. *Amyx.*

A-H 600 *Studies in Ancient Art.* (3) alt. yr.
Special studies: Ancient Art to emphasize the material and stylistic factors in the development of art, and the relevant cultural factors within a given area or period. Prereq: Graduate standing and consent of the Department. Three class hours per week.

A-H 630 *Studies in Medieval Art.* (3) alt. yr.
Intensive study of specific topics in Western European art between Constantine and Giotto, roughly 300 to 1200 A.D., according to the special interests and needs of individual students. May be repeated for a maximum of 6 credits. Three class hours per week. Prereq: Graduate standing and consent of the Department. *Freeman.*

A-H 650 *Studies in Italian Renaissance Art.* (3) alt. yr.
Special studies in the Art of Italy between 1300 and 1600, with emphasis on the material, stylistic factors in the development of art, and the relevant cultural factors within a given area or period. Three class hours per week. Prereq: Graduate standing and consent of the Department. *Amyx.*

A-H 670 *Studies in Modern Art.* (3) alt. yr.
Special studies in selected topics in 19th and 20th Century European and American art. Three class hours per week. Prereq: Graduate standing and consent of the Department. *Sandvik.*

A-H 781 *Problems in Art History and Criticism.* (3) I, II, S
Sustained individual research and interpretation in history, criticism, aesthetics. May be repeated to a maximum of 9 credits. Prereq: 12 hours in art history and criticism and the consent of the instructor. *Amyx.*

ART EDUCATION COURSES

A-E 575 *Art in Elementary Schools.* (3) I, S
Study of perceptual and aesthetic awareness in children. Methods and materials appropriate to the teaching of art in the elementary school. Prereq: Major in Art Education. *Frederick.*

A-E 577 *Art in Secondary Schools.* (3) II, S
Art for teachers in secondary schools. The literature of art education. Courses of study. Teaching materials. Lectures, conferences, and reports. *Harris.*

A-E 579 *Seminar in Art Education.* (2)
A relationship of current philosophies of art education and aesthetics; a consolidation of art education ideas with a formation of criteria for making value judgments; a development of a vocabulary consistent with education and art. Prereq: Major in Art Education.

670 *School and Community Art.* (3)
Analyses of the social function of art; organization of school and community programs in art; case studies of existing programs. Emphasis on relation of school programs to community needs. Prereq: A-H 371; A-E 575 or 577; SOC 220; EDF 661 or EDC 732; or consent of instructor.

Art 768 *Residence Credit for Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

BIOLOGICAL SCIENCES

BIOLOGY

The Thomas Hunt Morgan School of Biological Sciences provides a program in Biology leading to the degree of Doctor of Philosophy. The program draws upon the various courses and faculty members in the biological sciences. The purpose of this graduate program is to train participants as well-rounded biologists familiar with the main branches of the biological sciences and the auxiliary fields of mathematics, physics, and chemistry. Only one modern foreign language is required.

A student who receives his degree under this program also will be sufficiently well-trained in one of the major branches of biology to be able to conduct research in that special field, as well as broadly enough trained to participate in the teaching program of a department of biology. Students will be expected to have a background of course work in botany, zoology, genetics, physiology, calculus and organic chemistry before starting their doctoral program. All students accepted in this program will be required to take courses in biochemistry or physiological chemistry.

Major work under the biological sciences program would be arranged to suit the preparation, needs and interests of the individual student. The work could be, for example in genetics and cytogenetics, ecology and evolution, vertebrate zoology, invertebrate zoology, entomology, developmental biology, histology, parasitology, plant physiology, plant morphogenesis, algalogy, systematic botany, mycology, cellular biology, radiation biology, etc.

Laboratory facilities and equipment are quite adequate for doctoral work in all branches of biology. An excellent biology library containing over 10,000 volumes, and including many important American and foreign periodicals is available and is supplemented by over 200,000 volumes concerned with biology in the libraries of the College of Agriculture, the College of Medicine and the Departments of Chemistry, Physics, and Geology.

For appropriate courses see the Departments offering courses in the various areas of biology.

Additional graduate programs offered within the Thomas Hunt Morgan School of Biological Sciences are Biochemistry, Botany, Microbiology, Physiology and Biophysics, Plant Physiology, and Zoology. Detailed descriptions of these programs, and courses offerings, are listed elsewhere in this catalog.

BOTANY

Botany, a department in the Thomas Hunt Morgan School of Biological Sciences, offers a program in botany leading to the Master of Arts or Master of Science degree. Plan A is ordinarily required for the master's degree but Plan B is permitted under certain circumstances. Two semesters of meaningful teaching experience are required of all degree candidates.

A program in biology which leads to the degree Doctor of Philosophy is offered in cooperation with other departments in the Morgan School. The Department of Botany also participates with other departments in the University in a program in plant physiology which awards the Doctor of Philosophy degree. Fields of study within the department include algology, anatomy, cytology, morphogenesis, mycology, plant ecology, plant physiology, systematics, plant and microbial ultrastructure. There are electron microscope facilities available.

400 *Fundamentals of Biology for Secondary School Teachers.* (4) S
A course designed to aid the teacher in the selection of subject matter and in the presentation of modern biology to high school students. Lectures, discussions, laboratories, 10 hours per week; Prereq: Employment as a high school teacher. (Same as ZOO 400.) *Carpenter and others.*

402 *Advanced Topics in Biology for Secondary School Teachers.* (4) S
A treatment of selected topics from the point of view of modern developments designed to aid the high school teacher to keep abreast of changes in theory and practice, to increase his knowledge of subject matter, and to provide better motivation for his students. Lectures, discussions, and demonstrations, 8 hrs. per week. Prereq: Employment as high school teacher and consent of instructor. (Same as ZOO 402).

501 *Plant Physiology.* (3-5)
Basic principles of plant physiology; the physiological processes of green plants and the effect of the environment on these processes. Lecture, 3 hrs. per week; laboratory, 2 two-hour per week during regular session. Prereq: Six credits in Botany or Biology and two semesters of inorganic chemistry. *Henrickson.*

506 *Special Problems.* (1-3) I, II
Independent work in some phase of advanced Botany. Prereq: consent of instructor. May be repeated to a maximum of twelve credits. *Staff.*

507 *Algology.* (4)
A survey of the physiology, structure, life histories, genetics and relationships of the various groups comprising the algae, with the main emphasis upon the fresh-water green algae. Prereq: six credits in Biology. Lectures, 2 hours per week; laboratory, 2 hours per week. *Harris.*

513 *Ecology.* (4) I
The relationships of plants to the physical, chemical and biotic factors of their environment. Adaptations of species to these environmental factors are emphasized. Prereq: six credits of botany. Lecture, three hours; lab, two hours per week.

515 *Seminar.* (1) I, II
Readings and reports of special topics. Required of all Senior Botany Majors. May be repeated to a maximum of two credits. *Staff.*

521 *Anatomy of Vascular Plants.* (4) I
The nature and origin of primary and secondary tissues and their distribution in plant organs; the use of anatomical information in phylogeny, pathology, ecology and other research areas. Lectures, 2 hours per week; two two-hour labs per week. Prereq: six credits in Botany. *Sabharwal.*

524 *Mycology.* (4) I

The structure, life history, and physiology of the fungi. Lectures, 2 hours per week; laboratory, 4 hours per week. Prereq: BOT 101 or its equivalent. *Leonard.*

528 *Plant Cytology.* (4) I

The structure of plant cells; mitosis and meiosis. Lectures, 3 hrs. per week; two hrs. lab per week. Prereq: 3 credits in the biological sciences. *Riley.*

530 *Introduction to Heredity.* (3) II

The principles of heredity and their physical basis. Lectures, 3 hours per week. Prereq: 3 credits in the biological sciences. *Riley.*

541 *Plant Pathology.* (3) II

Significance, nature, causes, and methods of control of plant diseases. Lectures, discussion, 2 hours per week; laboratory, 2 hours per week. Prereq: BOT 101, or 125 (Same as PPA 541.) *Diachun or Chapman.*

551 *Taxonomy of Vascular Plants.* (4) I

A study of the principles and practices of taxonomy and a detailed consideration of the families of vascular plants. Lectures, 2 hours per week; laboratory, 2 two-hour labs per week including field trips. Prereq: BOT 101 or BIO 101, or consent of instructor. *Meijer.*

560 *Plant Microtechnique.* (3) I

The principal methods used in the preservation and preparation of plant materials for microscopic examination; basic microscopy; histochemistry; techniques for measurement and illustration. Laboratory, 6 hours per week. Prereq: BOT 101 or 125. *Sabharwal.*

575 *Botanical Problems of Southern and Central Africa.* (3) II

Vegetative regions, significant plant families, plant migration, and climatic factors affecting the distribution of plants in South Africa, Central Africa, and adjacent territories. Prereq: 6 credits in Botany. *Riley.*

600 *Plant Morphogenesis.* (5)

Culture of isolated plant organs in test tubes containing synthetic media. Study of the effect of auxins, vitamins, amino acids and many other chemicals on the physiology and development of single cells, tissues and organs. Lectures, 2 hours per week; laboratory, 3 two-hour labs per week. Prereq: BOT 501, 521 or BOT 560 or consent of instructor. *Sabharwal.*

620 *Topics in Modern Botany.* (1-3)

A course for students in the biological and related sciences to be taught on various topics by specialists in their fields. Designed to give the student the most up-to-date information on the various topics. May be repeated three times for credit, but each time the course is taken, it must be under a different instructor. The type should be indicated by parentheses, i.e. (Systematic Botany), (Cytogenetics), (Morphogenesis), (Mycology), (Algal Physiology), etc. Prereq: Consent of instructor.

626 *Experimental Mycology.* (4)

A study of the genetics, physiology and morphogenetic systems in the fungi. Lecture, 2 hours per week; laboratory, 2 two-hour periods per week. Prereq: BOT 524 and consent of instructor.

634 *Cytogenetics.* (4) I

Cytological and genetic evidence for the chromosome theory; chromosome aberrations and their importance in heredity and evolution. The effect of ionizing radiation on chromosomes. Lectures, 3 hours per week; laboratory, 2 hours per week. Prereq: BOT 528, 530 or equivalent. *Riley.*

701 *Plant Metabolism.* (3) II

Various aspects of plant metabolism including photosynthesis, respiration, nitrogen and protein metabolism; enzyme kinetics; and relation of molecular structure of cell components to function. Lecture, 2 hrs. per week; laboratory, 2 hrs. per week. Prereq: CHE 236 or 232, BOT 501, or consent of instructor. *Eley.*

732 *Mineral Nutrition of Plants.* (3)
Discussion of the accumulation, translocation and utilization of mineral elements by higher plants. Emphasis will be placed on the relationships between these processes and plant metabolism. Lectures, 2 hrs. per week; laboratory, 3 hrs. per week. Prereq: BOT 701 or BCH 515 or consent of instructor. (Same as AGR 732.) *Hiatt.*

734 *Physiology of Growth and Development.* (3) II
A critical evaluation of research in selected aspects of plant growth and development. Emphasis will be on effects of growth environment. Lecture and discussion, 3 hrs. per week. Prereq: BOT 701 or consent of instructor. (Same as AGR 734). *Kasperbauer.*

735 *Biosystematics.* (3) II
Principles in the application of data from the fields of ecology, genetics, cytology, morphology, phytogeography, and physiology to the solution of taxonomic problems. Lectures, 3 hrs. per week. Prereq: BOT 551 and 530. *Riley.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
(In Biological Sciences). May be repeated indefinitely. *Staff.*

770 *Seminar.* (1)
Reports and discussions on various topics in botany. *Staff.*
May be repeated to a maximum of six credits.

790 *Research in Botany.* (1-6)
May be repeated indefinitely, at the discretion of the department. Type of research to be enclosed in parentheses, e.g., (Plant Morphology), (Mycology), (Systematic Botany). (Cytogenetics), etc.

GENETICS

Graduate degrees are not offered in this area at present. The following courses are available to students in other graduate programs.

BIO 620 *Genetic Structure of Populations.* (3)
A discussion of the development, theory and practice of experimental and theoretical population genetics, including the basic dynamics and integrating properties of populations, factors which produce changes in populations and their effects on population structure and evolution. Three class hours per week. Prereq: An introductory course in genetics and in statistics, and consent of instructor.

BIO 760 *Developmental Genetics.* (3)
Discussion of metabolism, phenogenesis, immunogenicity, and molecular evolution as relates to gene action and its modification in basic development and physiological processes of higher organisms. Three class hours per week. Prereq: Adequate background in genetics and biochemistry and/or consent of instructor.

BIO 770 *Seminar in Genetics.* (1)
Review of current literature in genetics; presentation of papers on research in progress or on assigned topics; reports on meetings of scientific societies. Required of all graduate students in Genetics. May be repeated to a maximum of 10 credits. One class hour per week. Prereq: ASC 562 or BOT 532 or consent of instructor.

MICROBIOLOGY

The Department of Microbiology offers the Master of Science degree in the various fields of Microbiology, and the Doctor of Philosophy degree in the fields of morphology and physiology of microorganisms, immunology and serology, and medical and public health microbiology. Areas of research specialization include Microbial Biochemistry and Bioenergetics, Virology, Ecology, Microbial Genetics, Taxonomy, Gnotobiotics (germ-free animal research), and Electron Microscopy of microorganisms. A minimum of one foreign language is required for Ph.D. candidates.

Master's Plan B is permitted with departmental approval; all graduate students including those under Plan B are required to engage in graduate level research.

400 *General Bacteriology.* (4) I, II, S

Microorganisms; their morphology, classification, physiology, relation to certain fermentations, to food, to soil fertility, and to disease. Lecture and recitation, two hours; lab, 4 hours. Prereq: CHE 104 or 112. *Weaver.*

410 *Applied Bacteriology.* (2) I, II, S

A course in bacteriological analysis to supplement Courses 200 and 400. Laboratory, four hours. Prereq: MB 400 or 200; or 102 and CHE 112. *Wiseman and others.*

500 *Pathogenic Bacteriology.* (4) I, S

Human and animal pathogenic microorganisms, especially their morphological, cultural and pathogenic properties. Lecture, two hours; lab, four hours. Prereq: MB 400 or 200; or 102 and CHE 112. *Humphries, Ruchman and Hashimoto.*

512 *Growth and Death of Bacteria.* (4)

Physiological aspects of bacterial growth and death; chemotherapy and disinfection. Lecture, two hours; lab, four hours per week. Prereq: MB 102 or 200, CHE 232, and consent of instructor.

520 *Metabolism of Microorganisms.* (4)

Chemical changes produced by microorganisms; properties of their enzymes; the physiology of their growth. Lectures or conferences, two hours; lab, four hours. Prereq: CHE 232 and a reading knowledge of German or French. *Aleem and Wiseman.*

550 *Immunology and Serology.* (5) II

The theories and mechanism of infection and immunity; preparation, standardization, and uses of biological products; serology. Lecture, two hours; lab, six hours. Prereq: MB 500. *Humphries, Ruchman, Hashimoto.*

610 *Bacteriology of Foods.* (4) I

Dairy and miscellaneous food products; food preservation; food poisoning, standard methods for official food and public health laboratories. Lectures, two hours; lab, four hours. Prereq: MB 400 or 200; or 102 and CHE 112. *Weaver, Edwards.*

620 *Bacteriology of Water and Sewage.* (4) II

Microbiology of water; methods of purification. Sewage disposal methods. Operation of swimming pools. Standard and other methods for examination. Lecture, two hours; lab, four hours. Prereq: MB 400 or 200; or 102 and CHE 112. *Weaver, Edwards.*

635 *Clinical Mycology.* (2) I

Methods and techniques for isolating and propagating pathogenic actinomycetes and fungi. Lab. diagnosis of fungous infections. Lab., four hours a week. Prereq: MB 550, reading knowledge of one foreign language.

651 *Immunochemistry and Advanced Immunology.* (4) II
Chemistry of antigens and antibodies; of the reaction between them in vitro and in vivo; immune and hypersensitive reactions. Lecture and conferences, two hours; lab, four hours. Prereq: MB 550; CHE 232 and 444. *Humphries.*

660 *Electron Microscopy.* (3) II
Theory, operation and uses of the magnetic electron microscope and the vacuum unit for metal shadow casting. Lecture, one hour; lab, four hours. Prereq: Physics 232 and 242. *Edwards, Conti, Hashimoto.*

670 *Viruses and Rickettsiae.* (4) II
Nature, activities, and methods of laboratory cultivation of viruses and rickettsiae; their relation to bacteria, plants, and animals. Lecture, two hours; lab, four hours. Prereq: MB 550. *Ruchman.*

700 *History of Bacteriology.* (2) I
Conferences, two hours. Prereq: MB 550. *Weaver.*

710 *Special Topics in Cell Biology.* (2)
A variety of topics relating to modern molecular and cell biology. Prereq: Permission of instructor.

712 *Bacterial Anatomy, Taxonomy and Nomenclature.* (3) I
Study of anatomical structure of various groups of bacteria, theories of staining, principles of taxonomy, code of nomenclature of bacteria and viruses. Cytochemical procedures used in laboratory. Lectures and conferences, two hours. Lab, two hours. Prereq: MB 550; recommended CHE 232, MB 660. *Hashimoto, Weaver.*

714 *Microbial Genetics.* (4) I
The nature and action of genetic material in microorganisms. Lectures and conferences, two hours; lab, four hours. Prereq: Basic courses in Genetics and Microbiology; CHE 232. *Gray.*

722 *Metabolism of Microorganisms.* (4) II
Continuation of 520. Lectures or conferences, two hours; lab, four hours. Prereq: MB 520. *Aleem.*

768 *Residence Credit for Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Seminar.* (1) I, II
Review of current literature in microbiology; presentation of papers on work in progress in the department or on assigned topics; reports on meetings of national and international scientific and professional societies and symposia. Required of all graduate students. Two hours. May be repeated to a maximum of 10 credits. *Staff.*

790 *Research in Bacteriology.* (3 to 6) I, II, S
Laboratory, 10 hours. May be repeated to a maximum of twelve credits. *Staff.*

795 *Research in Bacteriology.* (3 to 6) I, II, S
Laboratory, 10 hours. Prereq: Master's Degree or equivalent.
May be repeated to a maximum of 24 credits. Prereq: Master's degree or equivalent. *Staff.*

PLANT PHYSIOLOGY

The interdepartmental graduate program in Plant Physiology offers a plan of study leading to the degree of Doctor of Philosophy. Faculty members of the program are plant physiologists from the Department of Botany in the College of Arts and Sciences and the Departments of Agronomy, Horticulture, and Plant Pathology in the College of Agriculture. The program is under the general purview of the Thomas Hunt Morgan School of Biological Sciences. Course offerings in plant physiology are listed under the Departments of Agronomy, Botany, and Plant Pathology. Work leading to the Doctor of Philosophy degree must conform to the general rules and regulations of the Graduate School, except that reading proficiency in one foreign language is required.

BIO 768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

BIO 769 769 *Residence Credit for the Doctor's Degree* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

BIO 771 *Seminar in Plant Physiology.* (1)

Reports and discussions on various topics in plant physiology. May be repeated for a maximum of eight credits.

ZOOLOGY

• Graduates of accredited colleges with a bachelor's degree in zoology or biology who satisfy the requirements of the graduate school may apply for admission to the graduate program for work leading to degrees of Master of Science or Master of Arts in Zoology according to Plan A or Plan B or a Doctor of Philosophy in Biology (see The Biological Sciences).

400 *Fundamentals of Biology for Secondary School Teachers.* (4)

A course designed to aid the teacher in the selection of subject matter and in the presentation of modern biology to high school students. Lectures, discussions; lab, 10 hours per week. Prereq: Employment as a high school teacher. (Same as BOT 400.)

402 *Advanced Topics in Biology for Secondary School Teachers.* (4)

A treatment of selected topics from the point of view of modern developments designed to aid the high school teacher to keep abreast of changes in theory and practice, to increase his knowledge of subject matter, and to provide better motivation for his students. Lectures, discussions, and demonstrations, 8 hrs. per wk. Prereq: Employment as high school teacher and consent of instructor. (Same as BOT 402)

502 *Principles of Physiology Lectures.* (3) I

A comprehensive discussion of physiology using advanced texts and library reading; includes function as related to major body systems. Three class hours per week. Prereq: One year Physics and Organic Chemistry. (Same as PGY 502.)

503 *Principles of Physiology.* (5) I
A comprehensive discussion of physiology using advanced texts and library reading; includes function as related to major body systems and laboratory experience with major experimental techniques. Prereq: One year Physics and Organic Chemistry. (Same as PGY 503.)

504 *Heredity.* (4) I
Lectures and recitations on principles of heredity, variation and eugenics. *Carpenter.*

506 *Embryology.* (4) II
A general course in ontogeny. Studies in maturation, fertilization, cleavage, organogenesis and anomalies of development with laboratory work based on the chick and pig. Prereq: ZOO 100; ZOO 104, or BIO 200-202; CHE 112. *Birge.*

508 *Evolution.* (3) II
An advanced lecture course on some of the fundamental principles of organic evolution. Prereq: ZOO 100, 104, or BIO 200-202. *Carpenter.*

509 *Zoology Seminar.* (1) I, II
Reports on: Technical papers in scientific journals, book reviews, recent developments in Zoology, scientific meetings. Required of all majors in Zoology. May be repeated for a maximum of 4 credits.

510 *Independent Work.* (3)
Special problems for individual students who are capable of pursuing independent investigations. May be repeated for a maximum of 12 credits. Prereq: Major and a standing of 3.0 in the department.

512 *Physiology of Development.* (3)
A review of theories of differentiation and a consideration of the genetic environment, and correlative physiological factors in differentiation. Lectures, assigned readings and literature reports. Prereq: ZOO 200 or 506.

513 *General Histology.* (4) I
A course in the technique of preparation of animal tissues for microscopic study. Practice in imbedding, staining, sectioning, mounting, and identification of tissues. Prereq: CHE 112, ZOO 100, ZOO 104 or BIO 200-202. *Dale.*

518 *Ornithology.* (4) II
A study of the life-histories, habits, identification, structure, adaptations, and physiology of birds. Special emphasis upon migrations, songs, nests and economic importance of our native birds. Lectures; field excursions; laboratory studies. Given alternate years. Prereq: ZOO 100, ZOO 104 or BIO 200-202. *Barbour.*

520 *Mammalogy.* (4) I
Designed to acquaint the student with the mammals of eastern North America, their classification, adaptations and natural history. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100, ZOO 104 or BIO 200-202. Given alternate years. *Barbour.*

522 *Herpetology.* (4) II
Designed to acquaint the student with the amphibians and reptiles of eastern North America, their classification, adaptations and natural history. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100, ZOO 104 or BIO 200-202. Given alternate years. *Barbour.*

524 *Ichthyology.* (4) I
Taxonomy of fishes with life-histories and biology of types. Fish structure and physiology, habits, ecology. Fish-culture and economic Ichthyology; care of fishes, aquaria, etc. Elements of fresh-water fishery administration. Prereq: ZOO 100, 104 or BIO 200-202. Given alternate years. *Kuehne.*

526 *Limnology.* (4) II
Detailed analysis of fresh water environment with special emphasis upon biological productivity. Two hours lecture, four hours field and laboratory. Prereq: CHE 110, 112, PHY 211, 213; ZOO 100, 104 or BIO 200-202; consent of instructor. *Kuehne.*

528 *General Entomology.* (4) II

Introduction to the Class Insecta. Morphology, physiology, development, systematics, and ecology of insects; procedures and techniques of insect identification; preparation of insect collections for research purposes. Lecture, two hours. Prereq: ZOO 100, ZOO 104 or BIO 200-202 and three additional credits in ZOO 502 or 570. *Barr.*

530 *Vertebrate Zoology.* (4) II

An intensive survey of the vertebrate classes, with emphasis on morphology, classification, phylogeny, trends in evolution, and adaptations. Two lecture and two lab periods per week. Prereq: ZOO 100, 104 or BIO 200-202. *Barbour.*

532 *Medical Entomology.* (4) I

Study of arthropod vectors of disease. Structure, collection, identification, control measures and life history studies. Given alternate years. Prereq: ZOO 534 or consent of instructor. (Same as ENT 532.) *Knapp.*

534 *Parasitology.* (4) I

Protozoan, helminth and arthropod parasites of man and domestic animals, emphasis on etiology, epidemiology, methods of diagnosis, control measures, and life histories. Techniques for host examination and preparation of material for study. Prereq: ZOO 100, 104 or BIO 200-202. (Same at ENT 534.) *Edney.*

536 *Medical Protozoology.* (4)

The etiology, epidemiology, pathology, diagnosis, prophylaxis and control of parasitic protozoa, with special emphasis on life cycles and detailed studies of the protozoan parasites of man. Given alternate years. Prereq: ZOO 534 or consent of instructor.

538 *Helminthology.* (4) II

The etiology, epidemiology, pathology, diagnosis, prophylaxis and control of trematode, cestode and nematode parasites of vertebrates, with special emphasis on those of veterinary and medical importance. Given alternate years. Prereq: ZOO 534 or consent of instructor. *Edney.*

540 *General Radiation Biology.* (4) II

A basic course devoted to a study of radiation techniques and research and their application in the various fields of biology. Lectures devoted to basic background and health hazard aspects followed by more comprehensive treatment of biological aspects. Laboratories devoted to use of radioisotopes and techniques of their measurement using various radiation detectors and counters. Lecture, 2 hours; lab, 4 hours per week. Prereq: Two years of biological sciences, one year of chemistry, and consent of instructor. *Carpenter, Calkins.*

542 *Insect Taxonomy.* (4) I

Methods and principles of systematic entomology and zoology; characterization of taxonomic categories; and international rules of zoological nomenclature. Collection, preparation and identification of insect specimens. Given alternate years. Lecture, 2 hours; lab, 4 hours. (Same as ENT 542.) Prereq: AGE 100 and ZOO 100, ZOO 104 or BIO 200-202. *Freytag.*

550 *Comparative Physiology.* (5) II

Physiological mechanisms by which animals cope with different environmental stresses. Osmoregulation, respiration, temperature regulation and tolerance, sensory reception, circulation, etc. Prereq: One year college chemistry, ZOO 570, one year college physics or consent of instructor. *Crawford.*

554 *Animal Ecology.* (4) I

An analysis of the environment and the respective adjustments of animal life to the environmental complex. Habitats, food, respiratory needs and mechanisms, life histories, animal associations, adaptations. Lecture, 3 hours; lab, 1 hour per week. Prereq: ZOO 100, ZOO 104 or BIO 200-202. *Kuehne.*

570 *Invertebrate Zoology.* (4) I

An intensive survey of the invertebrate phyla, including morphology, classification, phylogeny, general trends in the evolution of organ systems, and adaptations to varied modes of existence. Lecture, two hours; lab, two hours per week. Prereq: ZOO 100, ZOO 104 or BIO 200-202. *Barr.*

598 *Protozoology.* (4) II
A comprehensive study of the Phylum Protozoa emphasizing current concepts of classification, phylogeny and evolution, ultrastructure, reproduction, nutrition, growth and motile behavior. The laboratory involves collection, identification, cultivation and physiology of Protozoa with extensive observation and analysis of cellular function. Lecture, 2 hours; lab, 4 hours. Prereq: CHE 230-232, MA 113, 211, PHY 231-232 and at least eight hours in Zoology; ZOO 100, 104 or BIO 200-202. *Gittleson.*

602 *Insect Morphology.* (4) I
A study of internal and external insect structure, including function, and variation of form. Given alternate years. (Same as ENT 602.) Prereq: ENT 100 and consent of instructor. *Freytag.*

604 *Advanced Animal Ecology.* (3) II
Selected topics from recent studies on the energy flow concept of ecology, population ecology and community ecology. Prereq: ZOO 554 or BOT 513, one year of physics, organic chemistry and one year of mathematics; calculus and statistics recommended. *Davis.*

610 *Insect Ecology and Behavior.* (3)
The biotic and physical factors influencing the distribution, abundance, and behavior of insects and insect populations. Two class hours and two lab hours per week. Prereq: consent of instructor. (Same as ENT 610.)

611 *Speciation.* (3) I, II
Mechanisms of evolution. A discussion of modern theories and problems concerning the formation of animal species. Three hours per week. Prereq: ZOO 508. *Barr.*

615 *Seminar in Animal Navigation.* (2) I
Discussions of original literature on home range, homing ability and migration of animals. Prereq: Some reading knowledge of German. *Barbour, Davis.*

617 *Advanced Microtechnique.* (3) I, II
Special methods in histological technique for students of Zoology, Pathology or Anatomy. Prereq: ZOO 513, 515.

620 *General Acarology.* (4) II
Introduction to study of mites. Classification, morphology, physiology and ecology of mites important to the medical, veterinary and agricultural fields. Lecture, 2 hours; lab, 4 hours. Prereq: ZOO 100, ZOO 104 or BIO 200-202, ENT 100 and consent of instructor. (Same as ENT 620.) *Rodriguez.*

630 *Insect Physiology.* (4) II
Principles of insect physiology, function of organs, circulation, reproduction, respiration, and digestion. Lecture, 2 hours; lab, 4 hours. (Same as ENT 630.) Prereq: consent of instructor. *Dahlman.*

640 *Biological Effects of Radiation.* (3) I
A consideration of the action of ionizing radiation and ultra-violet light at progressively higher levels of organization. Recent experiments and current theoretical concepts will be emphasized. Three class hours per week. Prereq: ZOO 540-541, or 2 years in Chemistry, Physics, and Biological Sciences and consent of instructor. *Calkins.*

642 *Vertebrate Natural History.* (4) I
Behavior of vertebrate animals in their natural habitats as related to shelter, food, reproduction, and other aspects of survival. Adaptations contributing to behavioral patterns will be considered. Lecture, 2 hours; lab, 2 hours per week. Prereq: ZOO 502, 530. Given in alternate years. *Barbour.*

660 *Special Topics in Endocrinology.* (2)
A lecture-seminar course designed to explore in depth certain areas not covered in the introductory course. Usually invertebrate endocrinology, plant hormones, and physiology of reproduction will be covered. Two class hours per week. Prereq: ZOO 560 or equivalent.

709 *Graduate Seminar in Zoology.* (1) I, II

Discussions of current research in Zoology. Prereq: Graduate standing in biological sciences.

768 *Residence Credit for the Master's Degree.*

(1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

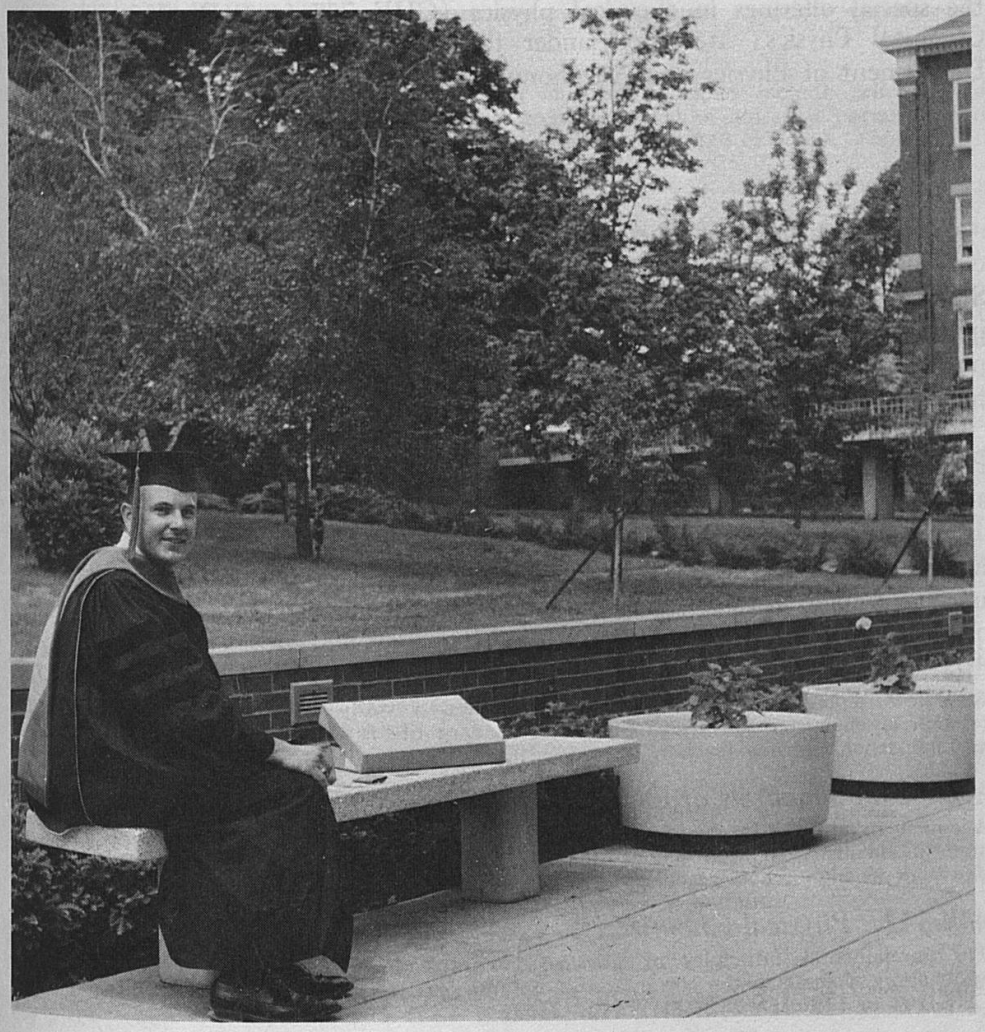
769 *Residence Credit for the Doctor's Degree.*

(1 to 12 credits equivalence)

May be repeated indefinitely. (In Biological Sciences). *Staff.*

790 *Research in Zoology.* (1-6) I, II

Independent research work under direction, with conferences on objectives, principles, materials, methods, analysis of data and conclusion. Progress reports required at intervals. May be repeated indefinitely at discretion of department. Type of research to be enclosed in parenthesis, e.g. (Genetics), (Ecology), (Embryology). Prereq: Undergraduate degree in biological sciences.



CHEMICAL PHYSICS

The Department of Chemistry and the Department of Physics and Astronomy jointly provide a program in chemical physics leading to the degree of Doctor of Philosophy. Chemical physics is an overlapping area of the fields of chemistry and physics and, because of its relevance to such fields as Astrophysics, Thermonuclear physics, and Biophysics, it currently enjoys a position of considerable esteem at a number of institutions. Experience shows that most exciting progress is made when members of the traditional fields of Chemistry and of Physics join together to form an operating unit of wide scope without the sacrifice of depth in the specialized areas. Students of either department are encouraged to follow a broader and richer curriculum by crossing departmental boundaries, both in the selection of courses and in the pursuit of independent research. Students and faculty frequently meet for informal seminars in chemical physics, encouraging exchange of information in the following research components of the chemical physics program: atomic and molecular theory, atomic and molecular processes, solid state theory and experiments, surface state physics, x-ray crystallography, and mass spectroscopy. Course offerings in chemistry and in physics, including the special offerings in chemical physics (CHE 755 or PHY 755, Topics in Chemical Physics) are listed under the Department of Chemistry and the Department of Physics and Astronomy.

CHEMISTRY

The Department of Chemistry offers the Master of Science and the Doctor of Philosophy degrees. Normally only Plan A is accepted for the Master of Science degree. Students may major in areas of chemistry such as analytical, inorganic, organic, physical and radio-nuclear as well as in fields like chemical physics and mass spectrometry. All candidates for the Ph.D. degree are required to serve as a teaching assistant for one semester.

A satisfactory reading knowledge of German is required for the M.S. and Ph.D. degrees. For the Ph.D. degree a satisfactory reading knowledge of an additional foreign language such as French or Russian is required.

All new graduate students must take proficiency examinations in analytical, inorganic, organic and physical chemistry. The results of these examinations are used as a guide in establishing the student's program of courses.

402,404 *Orientation in Modern Chemistry for Teachers.* (3 ea.) S
A review of the fundamentals of chemistry and a study of recent developments. The relation of chemistry to various aspects of modern life is considered. Prereq: Employment as high school science teacher.

406 *Fundamentals of Chemistry for High School Teachers.* (4) S
A course to aid the teacher in the selection of subject matter and in the presentation of modern chemistry to high school students. Lectures, discussions, six hours. Prereq: Employment as high school teacher.

440,442 *Physical Chemistry.* (3 ea.) I, II
The fundamental principles of physical chemistry are studied with emphasis on the application of these in the correlation of natural phenomena. Lecture, three hours. Prereq: CHE 104 or 112; MA 213; PHY 242. *Sands.*

441,443 *Physical Chemistry Laboratory.* (2 ea.) I, II
Laboratory studies in physical chemistry to accompany CHE 440, 442. Allow undergraduate credit only for chemistry majors. Six hours. *Bruner.*

444 *Physical Chemistry.* (3) II
For students in Agriculture and in the Biological Sciences. Prereq: CHE 236, PHY 213, MA 113.

506 *Advanced Topics in Chemistry for High School Teachers.* (4) S
A course in selected topics and modern developments to enhance the competence of the high school teacher. Lectures and discussion, twelve hours. Prereq: Employment as a high school teacher and consent of instructor.

510 *Advanced Inorganic Chemistry.* (3) I
A course dealing with the concepts of inorganic chemistry with emphasis on atomic structure, periodicity, nomenclature, bonding, chemistry of the non-transition elements and acid-base theories. Prereq: CHE 232 or consent of instructor. *Sears.*

512 *Inorganic Chemistry Laboratory.* (3)
Preparative techniques of inorganic chemistry to include the use of liquefied gases, aqueous and non-aqueous solutions, anhydrous and oxygen-free systems, and the handling of highly reactive materials. One class hour per week, six laboratory hours per week. Prereq: CHE 510 or equivalent.

520 *Radiochemistry.* (3) I
An introduction to the use of radionuclides in chemistry. Topics include principles of radioactive decay, interaction of radiations with matter, detection, hot-atom chemistry and specific applications. Lectures and lab, five hours. Prereq: CHE 226 or equiv. *Ehmann.*

522 *Instrumental Analysis.* (4) I, II
The theory and application of instrumental methods of analysis. Lectures, two hours; lab, six hours. Prereq: CHE 442. *Christian.*

528 *Principles of Analytical Chemistry.* (2) II
An intermediate study of the theory and practice of quantitative analysis. Lectures and discussion, two hours. Prereq: CHE 548 or consent of instructor. *Wagner.*

532 *Qualitative Organic Analysis.* (3) I, S
A systematic study of the separation and identification of organic compounds. Lecture, one hour; lab, six hours. Prereq: CHE 232, 233. *W. T. Smith.*

538 *Principles of Organic Chemistry.* (3) I
A general survey of the field of organic chemistry. Lecture, three hours. Prereq: CHE 232 and consent of instructor. *S. L. Smith.*

548 *Principles of Physical Chemistry.* (3) I
An intermediate course dealing with the fundamental principles of physical chemistry. Prereq: College physics, integral calculus and one course in physical chemistry. *Plucknett.*

550,552 *Physiological Chemistry.* (4 ea.) I, II
A study of the chemistry of living processes. Lectures and recitations, three hours; lab, three hours. Prereq: CHE 104 or 112, CHE 226 or equiv. and 232. *W. T. Smith.*

572 *Seminar.* (1) II
Reports and discussions on recent research and current chemical literature.

582 *Chemical Literature.* (1)
Training in the use of chemical literature. One hour per week. Prereq: junior or senior standing. *Black.*

610 *Chemistry of the Transition Metals.* (3) II
A detailed treatment of the chemistry of the transition elements, the lanthanides and actinides, including the structure of coordination complexes, bonding, reaction mechanisms and preparations. Prereq: CHE 510 or equivalent. *Sears.*

612 *Inorganic Chemistry of the Non-metals.* (3) II
A detailed treatment of the inorganic chemistry of the non-metals. Topics include theories of bonding, spectral characteristics, reaction mechanisms, preparations, physical methods of characterization and structural determination, and applications. Three class hours per week. Prereq: CHE 510 or equivalent. *Niedenzu.*

616 *Nuclear Chemistry.* (2) II
An advanced study of nuclear chemistry and radiochemistry. Lectures, two hours. Prereq: CHE 442, 443, 520. *Hofstetter.*

625 *Optical Methods of Analysis.* (3) II
An intensive study of the theory and applications of the following methods: emission spectroscopy, absorption spectrophotometry, colorimetry, refractometry, and polarimetry. Laboratory, six hours. Prereq: CHE 442; 522. *Wagner.*

626 *Advanced Analytical Chemistry.* (3) I
An advanced study of the theory and practice of quantitative analysis. Lectures and discussions, three hours. Prereq: CHE 528 or equiv. *Hammaker.*

633,635 *Advanced Organic Chemistry.* (3 ea.) II, I
Fundamental organic chemistry as interpreted by modern theory. Prereq: CHE 538 or consent of instructor. *Patterson.*

640 *Electrochemistry.* (2) I
Adsorption and potential distribution at the electrode surface. Mechanism and kinetics of electrode processes. Kinetic interpretation of such phenomena as reversibility and overvoltage. Lectures, two hours. Prereq: CHE 442 or 548. *Bauer.*

643 *Chemical Crystallography.* (2) I
An introduction to crystallography for chemists. Topics include the physical and chemical properties of crystals, crystal geometry, symmetry, x-ray diffraction, and crystal structure analysis. Prereq: CHE 442. *Sands.*

645 *Chemical Thermodynamics.* (3) II
Principles and applications of chemical thermodynamics. Lectures, three hours. Prereq: CHE 442, 443. *Sands.*

646 *Chemical Kinetics.* (3) I
Studies of chemical reactions from the standpoint of velocity and mechanism. Prereq: CHE 442. *Plucknett.*

647 *Quantum Chemistry.* (3) I
An introduction to quantum mechanics with emphasis on the aspects closely related to chemistry. Lectures, three hours. Prereq: MA 214 and consent of instructor. *Bruner.*

710 *Topics in Inorganic Chemistry.* (2) I
Discussion of topics of recent interest in inorganic chemistry, including physical methods, syntheses, and structural theories. Prereq: CHE 610 or 612 or consent of instructor. May be repeated to a maximum of 6 credits. *Niedenzu.*

714 *Non-Aqueous Solutions.* (2) II
A study of the properties of non-aqueous solutions and reactions in non-aqueous media. Lectures, two hours. Prereq: CHE 442, 443.

720 *Electrochemical Methods of Analysis.* (3) II
Classification of methods. Inherent and practical limits of sensitivity. Polarographic, voltametric and pulse methods. Lectures and laboratory, seven hours. Prereq: CHE 522 and 640. *Bauer.*

726 *Topics in Analytical Chemistry.* (3)
Selected topics which may include nuclear magnetic resonance, mass spectrometry, x-ray diffraction and spectroscopy, microscopy, and recent advances in analytical chemistry. Lectures, three hours. Prereq: CHE 442, 522.

730 *Theoretical Organic Chemistry.* (3) I
The application of the principles of kinetics, thermodynamics and quantum mechanics to the problems of organic chemistry. Lectures, three hours. Prereq: CHE 635 and MA 214.

733 *Stereochemistry of Organic Compounds.* (3) I
The steric aspects of fundamental organic processes; the application of optical rotatory dispersion to the problems of stereochemistry. Prereq: CHE 635.

736 *Topics in Organic Chemistry.* (2-4)
Selected topics which may include heterocyclic organic compounds, natural and synthetic dyes, carbohydrates, nitrogen compounds, and other recent advances in the field of organic chemistry. Lectures, two to four hours. May be repeated to a maximum of 12 credits. Prereq: consent of instructor.

743 *Molecular Structure.* (3) II
Applications of quantum theory to chemical problems, theories of the chemical bond, structure and spectra of molecules. Prereq: CHE 742. *Bruner.*

744 *Statistical Thermodynamics.* (3) II
The study of chemical thermodynamics from the viewpoint of the statistical treatment of systems rather than from the empirical classical approach. Lectures, three hours. Prereq: CHE 645 and MA 214. *Plucknett.*

746 *Topics in Physical Chemistry.* (2-4)
Selected topics which may include photochemistry, structure of crystals, molecular spectra, nature of the chemical bond, and other recent advances in the field of physical chemistry. Lectures, two to four hours. May be repeated to total of 12 credits. Prereq: CHE 548 or consent of instructor.

747 *Advanced Quantum Chemistry.* (3) II
An advanced treatment of quantum chemistry with emphasis on the methods and procedures used in its applications. Three class hours per week. Prereq: CHE 647. *Bruner.*

755 *Topics in Chemical Physics* (3)
An introduction to current research areas in chemical physics. Topics may include theory of atomic spectra, atomic and molecular processes, molecular theory, electrons and phonons in crystals, and optical properties of metals. Lectures, 2 or 3 hours. Prereq: Consent of instructor. May be repeated to a total of 12 credits. (Same as PHY 755.)

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.

776, 778 *Graduate Seminar.* (1 ea.) I, II
Reports and discussions on recent research and current literature. Required of all graduate students.

780 *Individual Work in Chemistry.* (1-5) I, II, S
Selected library and laboratory problems in conformance with the student's interest will be attacked and pursued under the direction of a suitable staff member who is proficient in the area under investigation.

790 *Research in Chemistry.* (1-5) I, II, S
Work may be taken in the following fields, subject to the approval of the Departmental Graduate Committee: Analytical Chemistry, Inorganic Chemistry, Organic Chemistry, Radiochemistry, or Physical Chemistry. May be repeated indefinitely.

CLASSICAL LANGUAGES AND LITERATURE

The study of classic Greek and Latin is based upon a long tradition of the liberal arts curriculum at the University of Kentucky. Graduate studies in ancient civilization, language and linguistics culminate in the M.A. degree in Classics according to Plan A or B.

Entrance requirements include a strong undergraduate major and satisfactory GRE score. Individual graduate programs are planned by the director of graduate study and adviser in consultation with the student.

The department offers a limited number of teaching assistantships. Those who hold appointments are not required to pay out-of-state fees. Additional information about graduate study is available from the department on request.

LATIN

509, 510 *Latin Literature.* (3 ea.) I, II, S
Courses in various authors, periods, or types to suit the needs of the class. Prereq: Three years of high school Latin or three semesters college Latin or permission of instructor.

511, 512 *Studies in Roman Philology.* (3 ea.) I, II, S
Courses to meet the needs of students in various areas of Roman philology, *e.g.,* in Latin literature, in Roman civilization, in Latin linguistics, etc. Prereq: permission of instructor.

514, 515 *Latin Composition.* (1 ea.) I, II, S
The writing of Latin prose of moderate difficulty. Prereq: CL 203 or permission of instructor.

521 *Roman Civilization.* (2) II, S
Special reference to the relation to modern life. Topics in literature, art, philosophy, and religion as well as in political history. No knowledge of Latin necessary.

530 *The Teaching of Latin.* (3) II, S
The place of Latin and the classical humanities in general education. Objectives, materials and methods. The reading approach to learning Latin. Evaluation of textbooks and other teaching materials. Prereq: senior standing.

Note: See also "Classics in General."

GREEK

520 *Greek Civilization.* (2) II, S
Special reference to relation to modern life. Emphasis placed on literature, art, philosophy and religion, rather than on political history, and the student may concentrate his reading in any field. No knowledge of Greek necessary.

556 *Greek Tragedy.* (3) I
Selected plays from Aeschylus, Sophocles, and Euripides. Lectures on Greek tragedy and its effect on the Western World. Prereq: CLA 254 or 255 or consent of instructor.

559 *Greek Comedy.* (3) II
Selected plays of Aristophanes. Lectures on Greek comedy and its effect on the Western World. Prereq: CLA 556 or consent of instructor.

561, 562 *Studies in Greek Philology.* (3 ea.) I, II, S
Courses to meet the needs of students in various areas of Greek philology, e.g., in Greek literature, in Greek civilization, in Greek linguistics, etc. Prereq: permission of instructor.

652 *The Greek of the New Testament.* (3) I, II, S
Class and/or individual work. Reading or research in the vocabulary and syntax of the *Koine,* in the text of the New Testament and in other fields. Prereq: Two years of College Greek or consent of instructor.

Note: See also "Classics in General" below.

CLASSICS IN GENERAL

524 *Greek Literature in Translation.* (3) I
Extensive reading in the most important works. Discussion of the significance of the works in their own and later times to the present. No knowledge of Greek necessary. *Thompson.*

525 *Latin Literature in Translation.* (3) II
Extensive reading in the most important works. Discussion of the significance of the works in their own and later times to the present. No knowledge of Latin necessary. *Thompson.*

580 *Independent Work in Classics.* (3) I, II, S
Courses to meet the needs of the student will be arranged in various areas. Prereq: major standing of 3.0 in department. May be repeated to a maximum of twelve credits.

632 *Comparative Greek and Latin Grammar.* (3) I, II, S
Studies and research in comparative linguistics, historical syntax, semantics, and other aspects of linguistics in the Greek and Latin area. Prereq: Necessary command of languages involved.

633 *Intensive Study of an Author.* (3) I, II, S
Studies or research in the works of an author (*e.g.,* Plato, Aristotle, Lucretius, Caesar, Ovid, or Horace) with due regard to his sources, milieu, purposes, technique, language, and influence on later periods. Prereq: Necessary command of languages involved.

636 *Intensive Study of a Period.* (3) I, II, S
Studies and research in a period of significance (Age of Pericles, Hellenistic Age, Ciceronian Age, Augustan Age, Silver Age, Christian Latin, or Medieval Latin) with emphasis on literary, social, and linguistic trends, with consideration of sources, and of influence on later periods. Prereq: Necessary command of languages involved.

637 *Intensive Study of a Literary Genre.* (3) I, II, S
Studies or research in a genre (epic, tragedy, comedy, satire, history, or the novel) from its beginnings in the ancient world and throughout its development in the ancient world with some attention to its effect on later periods. Prereq: Necessary command of languages involved.

638 *The Transmission of Classical Texts.* (3) I, II
Preservation and transmission of Greek and Latin texts. Introduction to epigraphy and paleography. Introduction to the history of classical scholarship. Prereq: Reading knowledge of Greek and Latin. *Thompson.*

768 *Residence Credit for the Master's Degree.* (1 to 9 wks. residence)
May be repeated once. Maximum of nine weeks can be applied toward master's degree with thesis. *Staff.*

790 *Research in the Teaching of Classical Languages.* (3) I, II, S
Problems in the teaching of Latin and/or Greek in secondary and/or higher education. Objectives, methods, preparation of materials, development of curricula or the history of the field. Prereq: CLA 530 or equivalent.

COMMUNICATIONS

THE MASTER OF ARTS DEGREE IN COMMUNICATIONS

The School offers a program leading to the Master of Arts degree which is designed to serve the needs of students with varied goals and backgrounds. Goals may include teaching, research, professional work on the media, or a combination of these. The program is open to students with previous work in journalism, radio-television-films, speech, or other academic areas. Students with no previous work in a communications area will be required to take from 5 to 10 hours of undergraduate work without graduate credit.

From 15 to 24 of the required hours of graduate credit will be taken in communications courses. A minimum of 12 credits in 600 level or higher communications courses, including CMO 651 and CMO 665, are required.

Students can elect, with the approval of their adviser, to work under Plan A or Plan B as described in this bulletin. Students primarily interested in communications research normally follow Plan A which consists of 24 hours of course work plus a thesis. The course work includes 12 hours of communications core work and related courses in communications and other areas of the University. Students electing to follow Plan B take 30 hours of course work consisting of 12 hours of communications core work, plus 3 to 12 hours of communications options and 6 to 15 hours of options in some other area of the University. Eighteen of the minimum 30 credits must be in 600 level or higher courses.

COURSES IN COMMUNICATIONS

550 *Introduction to Communications Research.* (3) II

To introduce undergraduate students to the philosophy of research—particularly as it applies to communications; and to study the principal types of communications research so that the student will be able to do simple projects and interpret research findings in his field. Three class hours per week. *Staff.*

551 *The Communications Process.* (3) II

Considers the communication process and effects of communications on the individual. Draws upon research in these areas from the fields of communication, political science, psychology, sociology, and journalism. *Donohew.*

553 *Mass Communication and Social Issues.* (3) I, II, S

A course devoted to examination of criticism of the mass media and an evaluation of the relationship of mass communication to contemporary social issues. *Donohew.*

554 *Seminar in Communications.* (2)

Intensive study of a communication topic in professional, theoretical, and research (methodology) areas. May be repeated to a maximum of six credits. *Staff.*

607 *Evaluating and Communicating Information.* (3) I, S

A study of the communications systems with which students will work, of the effect of the communications systems on public decisions, and of the means by which students work efficiently with communications systems. *Murphy.*

608 *Mass Communications and Society.* (3) I, S

A study of the ways in which the communications media play their roles in contemporary society with special attention to the major functions, rights, and responsibilities of media and individuals. *Thorp.*

613 *Introduction to Information Science.* (3) I, S

Introduction to the major aspects of scientific and technical information centers, documentation and the use and users of scientific information. Knowledge of systems analysis would be helpful. Prereq: CS 220 or equivalent. (Same as LS 613) *Sanderlin.*

614 *Information Storage and Retrieval Systems.* (3) II

Review of the various solutions for storing and retrieving information, ranging from traditional records and devices to modern computers. Emphasis upon modern electronic equipment for information handling. Prereq: LS 613. (Same as LS 614). *Sanderlin.*

615 *Information Systems Design.* (3) I, S

Principles and problems of information systems: systems analysis applied to information systems. Design of information systems with particular attention to equipment, training of personnel, and evaluation. Prereq: LS 614. (Same as LS 615). *Sanderlin.*

651 *Communications Theory.* (3) II

Major theories of the communications process and review of experiments and field studies on communications. Readings, discussion, and student experiments testing theoretical propositions about communications. Prereq: Course in statistics or in design of social research. *Donohew.*

665 *Communications Research Methods.* (3) II

The scientific method. Communications research as a part of social science research. Study and practice of advanced behavioral research techniques which apply to communications. Prereq: A behavioral research course and permission of instructor. *Murphy.*

705 *Seminar: Information Sciences.* (3)

An investigation of the parameters of the information sciences from an interdisciplinary approach. Investigation and analysis of the literature of communications, management science, cybernetics, information theory to identify the similarities and differences. From this investigation, both qualitative and quantitative concepts of the directions of information science will be derived. Three class hours per week. (Same as LS 705).

730 *Seminar in Mass Media and Public Policy.* (2) II

The role of mass communications media in making public policy and the effects of public policies on the mass media. One subject area will be investigated each semester; typical topics are: (a) political campaign communications; (b) censorship; (c) controversial public issues; (d) rights; (e) international and world agreements. Prereq: Graduate standing. *Staff.*

781 *Directed Study in Communication.* (1-6)

To provide advanced students with an opportunity for independent work to be conducted in regular consultation with the instructor. May be repeated for a total of six credits. (To be used for independent work.) Prereq: Consent of instructor.

COURSES IN JOURNALISM

501 *News Reporting.* (3) I, II

A reporting course which emphasizes special fields of information, news gathering, and news evaluation. *Thorp.*

503 *Copyreading and Editing.* (3) I, II

Instruction and practice in newspaper desk work. Preparation of local, state, telegraph, and radio news and features; picture editing, and page makeup. Lecture, one hour; lab, four hours. Prereq: JOU 501. *McCauley.*

507 *Feature Writing.* (3) I, II

Instruction and practice in writing features. Lectures, readings, and reports directed toward discovering, gathering, organizing, writing, and marketing feature articles. Prereq: senior standing or permission of instructor. *Moore.*

509 *Magazine Article Writing.* (3) II, S
Lectures, personal conferences and practice in writing and submitting material for publication in magazines; study of the markets for this material; free-lance article writing. Prereq: senior or graduate standing or permission of instructor. *Moore.*

511 *Editorial Writing.* (2) I, II
A study of editorials, editorial columns, and editorial pages. Publication of copy encouraged. *McCauley.*

513 *Supervision of High School Publications.* (1-3) S
A study of the problems that confront the adviser of the high school newspaper or magazine. Open to advisers or prospective advisers with consent of the instructor. *McCauley.*

531 *Law of the Press.* (2) II
A study of the special laws of libel, copyright, and regulatory provisions that pertain to the press. *Plummer.*

535 *History of Journalism.* (3) II
A study of the rise and development of American journalism and newspaper. Prereq: senior standing. *Thorp.*

537 *Seminar in Public Opinion.* (3)
A detailed examination of techniques developed and used by the press in influencing public opinion. Specific cases studied. Latter part of course devoted to the preparation of newspaper campaigns dealing with current problems of society. Prereq: senior or graduate standing. *Moore.*

539 *Reporting Public Affairs.* (3) II
Instruction and practice in reporting the news originating in courts and other public institutions. Prereq: JOU 501, senior standing.

541 *Public Relations.* (3) II, S
Lectures and practice dealing with the aims and methods of writing news and special articles for public relations programs of business, schools, colleges, libraries, and of the social service organizations. *McCauley.*

561 *Newspaper and Magazine Advertising.* (3) I, II
Relation of newspapers and magazines with advertisers, with emphasis upon the preparation of local display and national advertising. Prereq: consent of instructor. *Wild.*

563 *Advertising Procedures.* (3) I, II
Study of organizations and functions of advertising institutions and of product analysis, and research, consumer motivation, production methods, copy and layout. Lecture, two hours; lab, two hours. Prereq: JOU 561.

571 *Community Journalism.* (3) I, S
A study of the problems which confront the community weekly and the small city daily. *Staff.*

573 *Newspaper Administration.* (3) II
A study of the business, circulation, advertising, and accounting divisions of the newspaper with special emphasis on the community newspaper. *Staff.*

575 *Typography.* (2) I, II
Instruction and practice in typographic composition. Use of type faces in news editing. Study of typography in the make-up of American newspapers. Laboratory, four hours. Prereq: consent of instructor. *Wild.*

581 *Introduction to Press Photography.* (3) I, II, S
Use of cameras, printers, enlargers and laboratory equipment in modern press photography; and a study of selected readings on photographic methods and skills. Prereq: consent of instructor. *Staff.*

591 *Radio News Scripts.* (2) I, II

Instruction and practice in writing news and feature material for radio presentation. *Moore.*

599 *Advanced Writing for the Mass Media.* (3) II

A course designed to provide communications majors advanced training in reporting and writing articles on current events, public issues, personalities, culture and entertainment for newspapers, magazines and the broadcast media. Twice weekly seminars. Laboratory and independent work by students as needed to complete assignments; individual consultation between instructor and students. Prereq: consent of instructor. *Staff.*

COURSES IN TELECOMMUNICATIONS

421 *Television Production.* (2)

Translation of ideas into television programs. Students prepare, produce, and direct different program types designed to illustrate the process of solving problems of creative work in television. Lecture, 1 hour; lab, 4 hours per week. Prereq: TEL 312.

432 *Film Production.* (2)

Integration of visual images with emphasis on idea presentation, form, and structure for motion pictures. Lecture, 1 hour; lab, 4 hours per week. Prereq: TEL 312.

500 *Program and Audience Analysis.* (3)

Course designed to assist students to develop criteria for analyzing structure and content of programs, for analyzing audience size and composition, for analyzing the relationship of audience, program, and the American system. Lecture, 2 hours; lab, 2 hours per week.

501 *Broadcasting Regulations.* (3) I

A study of the governmental regulations of broadcasting by the FCC and other federal, state, and local agencies: licensing, libel and slander, copyrights, illegal practices, self regulation. Lecture and recitation, three hours. *Staff.*

505 *Broadcast Program Policies.* (2)

The determination of program policies, program scheduling, and program planning for a community. Two class hours. Prereq: TEL 500.

507 *The Public Affairs Program.* (2)

The role of broadcasting in politics, public affairs, education and the arts. A consideration of the factors which determine the form, function, and method used by documentaries, interviews, newscasts, and their program forms. Two class hours, 2 lab hours. Prereq: TEL 500.

510 *Radio and Television Advertising.* (2) I

The data and technique of radio and television advertising, including problems of coverage and circulation, spot campaigns, testing, time buying, the agency, measuring broadcast effectiveness, merchandising radio and television advertising, and time selling. Lecture and recitation, two hours. *Staff.*

530 *Pro-Seminar in Radio and Television.* (2) II

Discussion and reports on current broadcasting highlights and problems. Required of all seniors. Lecture and recitation, 2 hours. *Staff.*

COURSES IN SPEECH

500 *Speech Analysis and Perception.* (3)

Physics of sound; acoustic and structural properties of speech and their relationships to speech perception; analysis of speech intensity, fundamental frequency, wave composition, and time (rate, duration, and transitional change). (Same as EDS 500.)

581 *Communication Processes in Discussion.* (3)

A study of the communication processes in small group discussions; emphasis on empirical research findings concerning leadership, interpersonal relations, and the logical and psychological aspects of group problem-solving.

582 *Persuasion.* (3)
The principles and methods of persuasion. Of particular benefit to teachers, lawyers, business majors, and other persons whose work is concerned with motivating human conduct. *Blyton, Patterson.*

583 *Studies in Argumentation.* (3)
A study of the theories of argumentation and debate as derived from rhetorical, philosophical and psychological sources; critical examination of representative examples of oral argument.

584 *Teaching of Speech.* (3)
An analysis of the field of speech education as related to the teacher of speech. *Blyton, Patterson.*

585 *American Public Address to 1865.* (3)
An historical and critical study of public discussion in the United States, from the Colonial Period to 1865, through the analysis of major speakers, speeches, and debates. Prereq: Permission of instructor. *Patterson.*

586 *American Public Address since 1865.* (3)
An historical and critical study of public address in the United States from 1865 to the present. Prereq: Permission of instructor. *Patterson.*

588 *Oral Interpretation of Drama.* (3)
The cutting and adapting of the three-act play for oral presentation. *Sterrett.*

687 *Studies in Ancient and Medieval Rhetoric.* (3)
A comparative and critical study of the major treatises on the art of speaking, from the time of Aristotle to the Renaissance, with attention to the rhetorical practice, criticism, and pedagogy of the succeeding periods. Prereq: Permission of instructor.

688 *Studies in Renaissance and Modern Rhetoric.* (3)
A comparative and critical study of the major contributions to the body of rhetorical theory from the Renaissance to the present. Prereq: Permission of instructor. *Patterson.*

780 *Directed Studies.* (3)
Independent work devoted to study and research on specific subjects and problems according to the interests and needs of individual students. May be repeated to a maximum of nine credits. *Staff.*

782 *Special Topics in Speech.* (3)
Study and research on specific topics and problems according to the interests and needs of individual students. Normally offered as an independent work course. *Staff.*

COMPUTER SCIENCE

At present no graduate majors are offered in Computer Science

420 *Algorithmic Languages and Compilers.* (3)
This course acquaints the student with the formal description of procedure-oriented languages and techniques useful in the translation of these languages into computer programs. Prereq: CS 320.

440 *Information Processing Systems.* (3)
An introduction to structures of information sets covering syntactic or semantic relations. The generation, development and processing of structures and their interrelationships, machine instructions and storage hierarchies. Prereq: CS 320.

472 *Seminar.* (2)
Weekly report on current research papers. Discussion of new advances in computer science. (May be repeated to a maximum of 6 hours.) Prereq: CS 320 or 440, or consent of instructor.

525 *Analog and Hybrid Computer Techniques.* (3)
Application of analog and hybrid computers in the solution of systems of integro-differential-difference equations. Prereq: MA 214 or consent of instructor.

530 *Computational Methods.* (3)
A study of computational methods from the user's standpoint rather than from the designer's. Lecture, 2 hours; lab, 2 hours. Prereq: MA 421 or instructor's consent, plus ability to program a digital computer.

540 *System Simulation.* (3)
Computer simulation techniques including building and utilizing deterministic and stochastic models for digital and analog computers. Prereq: CS 220 or equivalent and a course in statistics.

560 *Non-Numerical Applications of Computers.* (3)
Introduction to and training in non-numerical techniques by digital computers. Prereq: CS 220 or equivalent.

570 *Computers and Programming Systems.* (3)
Advanced concepts in software design, development, and implementation including priority, executive, and real time computer systems. Prereq: CS 420.

DIPLOMACY AND INTERNATIONAL COMMERCE

The Patterson School offers an interdisciplinary master's degree and serves in an advisory capacity with respect to the Ph.D. programs in international studies in the Departments of Political Science, History, Economics, and Business Administration.

At least half of the 30 minimum hours for the M.A. degree must be in one of the major departments participating in the program (Business Administration, Economics, History, or Political Science). Each student is expected to complete a methodology course in his field of concentration (Political Science 671, History 606, Business Administration 636, or Economics 660, 661 or 662, depending on past training).

To assure the interdisciplinary character of the degree, the M.A. candidate is expected to take 12 to 15 hours distributed in at least two departments outside his major departmental concentration. Courses acceptable to the program deal with interstate and cultural relations, foreign policy, and national and regional developmental processes. Enough flexibility is allowed so that a student may concentrate his work in a specific geographical area such as Latin America, Africa, Asia, etc., or prepare himself more broadly in certain aspects of international studies.

The student must pass a written examination covering work in three subfields of study.

Students planning to continue their studies beyond the M.A. may apply for admission to one of the following Ph.D. programs:

International Relations: Students who wish to study international relations from a political perspective may do so under the Ph.D. program available in the Department of Political Science. Recent programs in this area have

involved work in conflict and decision theory, international organization, political development, foreign policy, and comparative government. Related work in other social sciences is also required.

Diplomatic History: The student who desires to work for the Ph.D. in diplomatic history may do so by shaping his program to meet the requirements of the Department of History. Such a program will entail some work in related courses in other departments. Under doctoral fields, the student would choose a specialty preparation in diplomatic history, and would write his dissertation in that field.

International Economics and Economic Development: Advanced study in economics related to international economics is available in the Department of Economics. Students planning to complete a Ph.D. in economics must meet all requirements as specified in the economics Ph.D. program. Two elective areas in international economics and economic development, together with two areas in economic theory and economic history, competence in statistics and a dissertation, form the program for a Ph.D. degree in economics with specialization in international economics or economic development.

International Business and Commerce: The College of Business and Economics offers a Doctor of Business Administration degree. Study in the areas of administrative science, research methodology, economic theory and quantitative analysis is basic to the D.B.A. degree. A major may be selected in the area of international business and a minor in a closely related field.

Since each of the above departments have varying requirements, it is to be expected that in many cases the Patterson School's interdisciplinary M.A. will require that the student take longer to complete his course work for the Ph.D. than if he had enrolled directly in one of the departments upon entering Graduate School. The additional work required is likely to be heaviest with respect to business administration, where the first year of graduate study is largely prescribed, and in economics, where certain methodology and service courses need to be completed early in the program. In all instances the extra time required will also be a function of how much work the student has had on the undergraduate level.

A number of non-service Patterson Fellowships are available from income from the bequest of James K. Patterson, the first president of the University, for students with an interest in these programs at both the M.A. and Ph.D. levels. Preference, however, will be given to those planning to continue their studies for the Ph.D. Inquiries regarding program details and fellowships should be addressed to the Director of Graduate Studies, Patterson School of Diplomacy and International Commerce.

768 *Residence Credit for the Master's Degree.*
(1-6 credits equivalence)

May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1-12 credits equivalence)

May be repeated indefinitely.

ENGLISH

The Department of English offers programs leading to the M.A. and to the Ph.D. degrees. The master's degree may be obtained either by Plan A or Plan B, as defined in this bulletin. With the consent of the Dean of the Graduate School and the Director of Graduate Studies in English, the student may undertake a program leading to the master's degree provided that he has

(1) completed the equivalent of a University of Kentucky undergraduate major in English and

(2) fulfilled the admission requirements of the Graduate School. An applicant who fails to meet the first qualification may be admitted with the understanding that his program must include some advanced undergraduate work in English in addition to the courses normally required for the M.A.

Each student will be evaluated on his merits before he is officially admitted to the doctoral program by the English graduate faculty. Students who receive their master's degrees from the University of Kentucky will be judged on their course grades, on the recommendations of their instructors, their Graduate Record Examination scores, and their performance in a diagnostic preliminary examination. Students who have received their master's degrees elsewhere will be evaluated on their course grades after the equivalent of one semester's full-time graduate work at the University of Kentucky, instructors' recommendations, GRE scores, and performance in the preliminary examination.

There is no specific requirement in a minor area, but such work may be required by a student's Special Committee if it appears to be essential to the major research or concentration interest. A Ph.D. candidate normally offers German and French for his language requirement, but substitutions may be authorized according to the procedure described in this bulletin.

A detailed statement of departmental requirements is available on request.

412 *History of the English Language.* (3)
A survey emphasizing the characteristics of English from the times of Alfred, Chaucer, Shakespeare, and Johnson to the present. *Cutler and others.*

425 *Shakespeare Survey.* (3)
A study of 10 to 12 of the major plays of Shakespeare including comedies, tragedies, and histories. The student may receive credit for this course and for either ENG 526 *or* ENG 527, but not both. Only one of these three courses may count toward fulfillment of the requirements for the English major. *Black and others.*

501 *Workshop in Imaginative Writing.* (2)
For advanced students. This course assumes that the student has already acquired competence as a writer. Prereq: English 207, and consent of the instructor. May (with consent of the instructor) be repeated once for a total of four credits. *Berry.*

509 *Composition for Teachers.* (3)
The basic studies helpful to high school teachers of composition. The teaching of grammar, punctuation, usage, etc., and of theme planning, correction, and revision. Students are required to do quite a bit of writing. *Crabb, Hatch, Van Gelder, Pival.*

510 *Modern British and American English.* (3)
A survey of modern British and American English with respect to pronounciation, syntax, spelling, and usage. Historical developments will be examined insofar as doing so sheds light on modern practice. *Cutler.*

512 *Grammar of Structure and Usage.* (3)
Descriptive grammar for advanced students. Analysis of sentence structure; consideration of standards of usage; investigation of current practice. ***Faust, Pival.***

514 *Descriptive Linguistics: Phonetics.* (3)
Articulatory description of speech sounds; practice in recognition and control. (Same as ANT 514.) Prereq: Consent of instructor. ***Faust.***

515 *Descriptive Linguistics: Phonemics.* (3)
An investigation of speech-sounds and systems of speech-sounds. Also attention to both speech and writing as communication systems. (Same as ANT 515.) Prereq: Consent of instructor. ***Faust.***

516 *Descriptive Linguistics: Morphemics.* (3)
An explanation of some of the ways speech sounds are put together in patterns so as to form languages. (Same as ANT 516.) Prereq: ENG 515; consent of instructor. ***Faust.***

520 *Chaucer.* (3)
Extensive readings in the principal works of Chaucer, with particular attention to *The Canterbury Tales* and *Troilus and Criseyde.* ***Staff.***

522 *English Literature: 1500-1600.* (3)
Literature of the Elizabethan period exclusive of the drama. Foreign sources of the English Renaissance. Major writers such as More, Ascham, Wyatt, Sidney, Spenser, Raleigh, and Marlowe. ***Stroup, Evans.***

523 *English Literature: 1600-1660.* (3)
Selected non-dramatic works of such writers as Bacon, Donne, Ben Jonson, George Herbert, Izaak Walton, Herrick, Sir Thomas Browne, Vaughan, Traherne, and Milton. ***Stroup.***

524 *Pre-Shakespearean Drama.* (2)
A course in English origins, beginning with the *Quem Quaeritis Trope* and extending through the works of the early Elizabethans. ***Stroup.***

525 *Elizabethan Drama, Exclusive of Shakespeare.* (3)
A survey of English drama from the early Elizabethans until the closing of the theatres. ***Stroup.***

526 *Shakespeare: the Comedies.* (3)
Shakespeare's comedies will be studied in detail. ***Black, Evans, and others.***

527 *Shakespeare: the Tragedies.* (3)
Shakespeare's tragedies will be studied in detail. ***Black, Evans, and others.***

528 *Milton.* (3)
A study of all of Milton's poetry and of his more important prose; readings from contemporary thinkers; studies in thought currents of the time and Milton's relation to them. ***Stroup.***

530 *Age of Pope.* (3)
Addison and Steele, Swift, Pope, Defoe, and other contemporary figures. ***Cooke and others.***

531 *Age of Johnson.* (2)
Johnson and his circle; Burke, Goldsmith, Gray, Walpole, Cowper. The Pre-Romantic movement. ***Cooke and others.***

532 *Restoration and Eighteenth-Century Drama.* (3)
A study of the dramatic types that arose between the closing of the theatres in 1642 and the death of Sheridan. ***Cooke.***

533 *Eighteenth-Century British Novel.* (3)
Study of the novel from its beginnings in English literature through the eighteenth century. *Cooke, Adelstein and others.*

535 *The Romantic Movement: 1780-1815.* (3)
A study of the poetry and prose of the first half of the romantic movement. The emphasis is on the poetry of Blake, Wordsworth, and Coleridge. *Ward, Gordon, and others.*

536 *The Romantic Movement: 1815-1830.* (3)
A study of the poetry and prose of the second half of the romantic movement. The emphasis is on the poetry of Keats, Shelley, and Byron. *Ward, Gordon, and others.*

538 *Victorian Literature: 1830-1860.* (3)
Poets and essayists—Macaulay, Mill, Carlyle, Newman, Tennyson, Mrs. Browning, Browning, Ruskin, and Arnold—in their historical setting. *Staff.*

539 *Victorian Literature: 1860-1900.* (2)
Poets and essayists—Rossetti, Swinburne, Meredith, Huxley, Pater, Wilde, Davidson, Henley, Stevenson, Housman, Hardy, Kipling, and some others—in their historical setting. *Staff.*

540 *Nineteenth Century British Novel.* (3)
Study of the novel in English literature from Scott through Gissing. *Staff.*

541 *Twentieth Century British Novel.* (3)
A study of the content and technique of the best 20th century British novels, with some consideration of these in relation to significant social, philosophical, and literary trends. *Evans.*

542 *Twentieth Century British Literature.* (3)
British literature of the 20th century, with particular attention to poetry, to literary movements, and to critical theory.

550 *American Literature Before 1800.* (2)
A survey of the development of American life, thought, and letters from the beginnings to 1800. *Staff.*

551 *American Literature: 1800-1860.* (3)
A survey of the development of American life, thought, and letters from 1800 to 1860. *Ringe, Jacobs, and others.*

552 *American Literature: 1860-1900.* (3)
A survey of the development of American life, thought, and letters in the later years of the 19th century. *Ringe, Jacobs, and others.*

553 *American Literature Since 1900.* (3)
A survey of the development of American life, thought, and letters in the 20th century. *Jacobs and others.*

554 *American Novel before 1900.* (3)
Study of the American novel from the beginnings to Henry James. *Ringe, Jacobs, and others.*

555 *Modern American Novel.* (3)
Novels chosen for their enduring value rather than historical importance. Attention to shifting techniques of fiction and to contrasting interpretation of the American scene. *Jacobs and others.*

560 *Comparative Literature I.* (3)
A study of Greek and Latin Literature from Homer to the Middle Ages. *Evans, Davenport.*

561 *Comparative Literature II.* (3)
Study in English of major works of continental European Literature. Late medieval period to mid-Seventeenth Century. *Evans.*

562 *Comparative Literature III.* (3)
Study in English of major works of continental European literature written in modern languages, especially French, German, Spanish, Italian, Russian, mid-Seventeenth Century to end of Nineteenth Century. *Evans, Davenport.*

563 *Comparative Literature IV.* (3)
Masterpieces and examples of twentieth-century Western World literature, with emphasis on the emergence of new forms and techniques invented to express the complexity of modern life. The course will study novels, poems, and plays in their traditional development and in experimental and divergent forms. *Davenport.*

565 *The Lyric in English.* (2)
A critical examination of selected lyrics from the Middle Ages to the present.

566 *Modern Drama.* (3)
Continental, British, and American dramatic literature from Ibsen to the present.

568 *History of Literary Criticism I.* (3)
Literary criticism in the Western World from Plato through the 18th century. Application of critical principles to literary works.

569 *History of Literary Criticism II.* (3)
Literary criticism in Europe and America from Wordsworth to the present. Application of critical principles to literary works. *Jacobs.*

570 *Literature of the Old Testament.* (3)
Critical analysis of the canonical and apocryphal Old Testament in English, with particular attention to Biblical ideas and symbols helpful to students of literature. *Cobb.*

571 *Literature of the New Testament.* (3)
Critical analysis of the canonical and apocryphal New Testament in English, with particular attention to Biblical ideas and symbols helpful to students of literature. *Cobb.*

572 *Studies in English for High School Teachers.* (1-3)
Specialized topics in language, literature, and composition designed to increase the high school teacher's knowledge of subject matter, to aid him in meeting major problems in the curriculum, and to enlarge his understanding of new developments and approaches to the teaching of high school English. Prereq: Employment as a high school teacher. May be repeated to a maximum of six credits. *Staff.*

573 *General Introduction to Folklore.* (3)
An introduction—on a world-wide scope—to the types of folklore. Emphasis upon folklore as a cultural phenomenon in its own right and upon its relations to literary types. The development of the science of folklore. *Jansen.*

574 *American Folklore.* (2)
A study of the major materials in American folklore. The use of this material in other forms. Experience in actual collecting and in the cataloging of materials. *Jansen.*

600 *Bibliography and Methods of Research.* (3)
Studies in enumerative bibliography and in the methods and materials of scholarly and critical investigation. Required of M.A. students in English. *Ward.*

610 *Old English.* (3)
Introduction to Old English language and literature. *Manning.*

611 *Beowulf.* (3)
Chiefly a study of *Beowulf*, with some reference to allied literature and the Germanic background. *Manning.*

612 *History of the English Language.* (3)
A survey tracing the development of modern standard English from its Indo-European origin. Emphasis will be placed on the history of sounds, inflections, and vocabulary and on varying concepts of "correctness." *Cutler, Manning.*

620 *Middle English Literature.* (3)
Survey of Middle English literature, exclusive of Chaucer, with collateral reading of non-English monuments in English translation. *Manning.*

622 *Studies in English Literature: 1500-1600.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. *Stroup.*

623 *Studies in English Literature: 1600-1660.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. *Stroup.*

630 *Studies in English Literature: 1660-1720.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. *Cooke.*

631 *Studies in English Literature: 1720-1780.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. *Cooke.*

635 *Studies in Literature: 1780-1815.* (3)
A study in depth of selected writers and movements. *Ward, Gordon.*

636 *Studies in Literature: 1815-1830.* (3)
A study in depth of selected writers and movements. *Ward, Gordon.*

638 *Studies in English Literature: 1830-1860.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. *Staff.*

639 *Studies in English Literature: 1860-1900.* (4)
Comprehensive study of broad topics, normally limited to an intensive survey of the literature and scholarship of the period as a whole. *Staff.*

651 *Studies in American Literature before 1860.* (3)
A study in depth of selected writers and movements. *Ringe, Jacobs.*

652 *Studies in American Literature since 1860.* (3)
A study in depth of selected writers and movements. *Ringe, Jacobs.*

660 *Modern Critical Theory.* (3)
Examination of the theories supporting the modern versions of genre, genetic, and formalist criticism.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

770 *Seminar in English Literature.* (3)
Intensive study and research centering upon such subjects as the following: a particular author or group of authors, a literary *genre*, a literary movement, a restricted period of time. May be repeated to a maximum of twelve credits. *Graduate Staff.*

772 *Seminar in American Literature.* (3)
Intensive study and research centering upon such subjects as the following: a particular author or group of authors, a literary *genre*, a literary movement, a restricted period of time. May be repeated to a maximum of six credits. *Graduate Staff.*

774 *Seminar in Comparative Literature.* (3)
Intensive study and research centering upon the relationship between English or American literature and that of some other country. May be repeated to a maximum of six credits. *Graduate Staff.*

780 *Directed Studies.* (1-3)
Independent work devoted to study and research on specific subjects and problems according to the interests and needs of individual students. May be repeated to a maximum of nine credits. *Graduate Staff.*

FRENCH LANGUAGE AND LITERATURE

The Department of French Language and Literature offers graduate programs leading to the M.A. and Ph.D. degrees in French language and literature.

Requirements for the M.A. degree in French: The department offers the M.A. degree according to Plan B only (see page 23). Candidates must demonstrate a reading knowledge of another foreign language and pass a written, comprehensive examination in *six* of the following areas: medieval, 16th, 17th, 18th, 19th, 20th Century French literature, and linguistics. The M.A. examination will be given every November, April, and July. Application for the examination should be made to the Director of Graduate Studies no later than 10 days prior to the date of examination.

Requirements for the Ph.D. degree in French: Applicants for the Ph.D. degree are required to complete at least two years of residence work beyond the M.A. In addition to their program of study in the department, candidates must demonstrate a reading knowledge of two other Romance languages (Latin included) or of one other Romance language and German or Russian.

Candidates for the Ph.D. degree are required to pass written examinations, followed by an oral examination, to be held after the papers have been read and graded. Candidates will be examined on their choice of *three* of the *four* following areas:

a. medieval *or* 16th Century French literature
b. the 17th Century *or* the 18th Century
c. the 19th Century *or* the 20th Century
d. linguistics.

The candidates's dissertation, submitted in accordance with the regulations of the Graduate School of Arts and Sciences, must be within one of the three areas chosen for the qualifying examination.

The Ph.D. written examinations are given three times a year: 1) September 15-30; 2) January 15-31; 3) March 20 to April 5. Candidates must give a

10-day notice of intention to take the test in writing to the Director of Graduate Studies.

For further information concerning the M.A. and Ph.D. programs in French, consult the Director of Graduate Studies.

412 *Advanced French Conversation.* (2)
A study of intonation and elocution in French. Three minute speeches in French will be prepared for each recitation. Some reading in French poetry will also be practiced. Prereq: FR 209.

414 *Twentieth Century French Literature in Translation.* (3)
A study of selected prose and poetry (in English translation), representative of the major trends in modern French literature. No knowledge of French is required. Not open to French majors. Three class hours per week. *Staff.*

415 *Masterpieces of French Literature in Translation.* (3)
A study of outstanding works of French poetry and prose to the end of the Nineteenth Century, with particular emphasis on movements in the Seventeenth and Nineteenth Centuries. No knowledge of French is required. Not open to French Majors. Three class hours per week. *Staff.*

450 *La Civilization Française au XXeme Siècle.* (3)
A survey of French culture in the XX century with emphasis on the period following World War II. Conducted in French. Prereq: FR 202. (Alternate years). *Staff.*

502 *Survey of XIX Century French Literature.* (3)
A study of the representative writers of the XIX Century and the more important literary movements. Outside reading and written reports on assigned topics. Three class hours per week. Prereq: FR 204, 205.

503 *Studies in XIX Century French Literature.* (3)
A study of a single genre or topic with representative readings selected from the literature of the XIX century. Three class hours per week. Prereq: FR 204, 205. *Duncan.*

504 *Survey of XVII Century French Literature.* (3)
A study of the representative writers of the XVII century and the more important literary movements. Outside reading and reports on assigned topics. Prereq: FR 204, 205. *Charron.*

505 *Studies in XVII Century French Literature.* (3)
A study of a single genre or topic with representative readings selected from the literature of the XVII century. Prereq: FR 204, 205. *Charron.*

506 *Advanced French Composition.* (3)
The course aims to present vocabulary and structures necessary in critical writing but not common to conversational French as well as to encourage logical thinking. Short weekly papers will be written and discussed in class. Reading material will be kept to a minimum and will serve as a subject matter for essay work. Three class hours per week.

508 *Survey of XVIII Century French Literature.* (3)
A study of the representative writers of the XVIII Century, with special attention given to Voltaire, Rousseau, Monesquieu, and Diderot. Prereq: FR 204, 205.

509 *Studies in XVIII Century French Literature.* (3)
A study of a single genre or topic with representative readings selected from the literature of the XVIII century. Prereq: FR 204, 205. *Mueller.*

510 *Survey of XX Century Literature* (3)
A study of representative writers of the XX century and the more important literary movements. Outside reading and reports on assigned topics. Prereq: FR 204, 205. *Langlois.*

511 *Studies in XX Century French Literature.* (3)
A study of a single genre or topic with representative readings selected from the literature of the XX century. Prereq: FR 204, 205. *Langlois.*

513 *Tutorial Seminar for Majors in the Romance Languages.* (1) I, II
A survey of French literature. Required of all majors in French during the senior year. May be repeated to a maximum of two credits. *Staff.*

516 *Introduction to Old French.* (3) I
An introduction to the study of early French, especially of the eleventh through the thirteenth centuries. Emphasis will be on understanding the language, with readings from selected literary works and discussion of Old French phonology and grammar. Prereq: FR 204, 205. *Rea.*

517 *Introduction to the Linguistic Structure of French.* (3) I, II, S
An outline of the structure of spoken French along with an introduction to the pertinent concepts of descriptive and contrastive linguistics. Prereq: FR 203 (two semesters) or equivalent; consent of instructor. *Rea.*

553 *The Teaching of Modern Foreign Languages.* (3) I, II, S
A course for teachers and prospective teachers of Spanish, French, or German. (Required of all graduate students in French). *Mueller.*

601, 602 *French Literature of the Renaissance.* (3 ea.) I, II, S
A course starting with François Villon and including such writers as Marot, Rabelais, Calvin, Montaigne, Ronsard, DuBellay, Belleau and Regnier. Given in French. Prereq: 21 semester hours of college French. *Keating.*

603 *The Development of the French Language.* (3) I, II, S
A history of the phonology and grammar of French from the origins to the present, with analysis and study of appropriate documents, literary and otherwise, to illustrate these developments, along with some introduction to the basic concepts of historical linguistics. Prereq: FR 516. *Rea.*

604 *Medieval Literature I: to the Thirteenth Century.* (3)
Selected works of the major epic cycles; the elaboration of the romantic lyric; courtly love and courtly romance; satirical and realistic tendencies in the fabliaux and the *Roman de Renart.* Readings in the original texts. Prereq: FR 516.

605 *Medieval Literature II: 13th to 15th Centuries.* (3) I
The new *ars poetica*: Machaut and Deschamps. Later lyric developments: Christine de Pisan, Charles de'Orleans, Villon, les grands rhetoriqueurs. The literary chronicles. The development of prose as a literary medium: *Lancelot-Graal, Quinze joies du mariage, Les Cent nouvelles nouvelles.* Three class hours per week. Prereq: Consent of instructor.

606 *Studies in Bibliography and Research Methods.* (3) I, II
Designed to serve the needs of students beginning graduate work in French by acquainting them with the tools of research. Required of Ph.D. candidates in French. Prereq: Consent of instructor. *Charron.*

610 *Romance Philology.* (3) I, II, S
Study of the historical development of the various Romance languages with reading on texts chiefly from the medieval period. Special attention will be given to historical phonology and morphology. May be repeated to a maximum of six credits. Prereq: FR 603 or equivalent. *Rea.*

702 *Seminar in the History of the French Language.* (3) I, II, S
A thorough presentation of the development of the French language with special attention to morphology and syntax and to developments since the middle ages. Prereq: FR 604. *Rea.*

703 *The Old French Chanson de Geste.* (3)
A study of the medieval French Epic, with special emphasis on works of the twelfth century, and embracing a detailed discussion of theories of the origin of the genre, with special emphasis on recent work. Three class hours per week. *Rea, Hicks.*

704 *Seminar in Classical Drama.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Charron.*

705 *Seminar in Classical Prose and Poetry.* (3), I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Charron.*

708 *Seminar in The Literature of the Enlightenment.* (3) I, II, S
Intensive study of selected works of one or more representatives of the Enlightenment in France. Prereq: Consent of instructor. *Staff.*

709 *Seminar in Eighteenth Century Novel and Drama.* (3) I, II, S
Intensive study of one or more authors who made significant contributions in these literary genres during the XVIII Century. Prereq: Consent of instructor. *Staff.*

710 *Seminar in Romanticism.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Staff.*

711 *Seminar in The Realist Novel.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. May be repeated to a maximum of six credits. Prereq: Consent of instructor. *Duncan.*

712 *Seminar in Post-Romantic Poetry of the Nineteenth Century.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Luszczynski.*

713 *Seminar in the Naturalist Novel.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Duncan.*

716 *Seminar in Contemporary Drama.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Staff.*

717 *Seminar in Contemporary Poetry.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Luszczynski.*

718 *Seminar in The Contemporary Novel.* (3) I, II, S
Intensive study of a single author or limited group of authors representative of this area of French literature. Prereq: Consent of instructor. *Langlois.*

719 *La Littérature engagée: Malraux, Sartre, Camus, etc.* (3) I, II, S
Intensive study of works selected from the literature of commitment in the 20th Century. Prereq: Consent of instructor. *Langlois.*

723 *The Medieval French Drama.* (3)
The ecclesiastic origins of the drama, semi-liturgical drama, miracle plays of the twelfth and thirteenth centuries, secular works and the jongleurs, late farces and the development of the mystery play. Three class hours per week. Prereq: FR 604. *Hicks.*

724 *Didactic Literature of the Middle Ages.* (3)
The development of allegory as a mode of expression, its adaptation to didactic ends and particularly to those of courty love, with concentration in the *Roman de la Rose* of Guillaume de Lorris. The development of scholastic method and its encroachment upon the domain of allegory; its triumph over the latter in the continuation of the *Rose* by Jean de Meung, with consideration of other "scientific" works of encyclopaedic tendencies. Three class hours per week. Prereq: FR 604. *Hicks.*

730 *Seminar in French Literature of the Renaissance.* (3)
Intensive study of a single author or group of authors representing the period of the French Renaissance. Three class hours per week. Prereq: FR 601. *Keating.*

731 *French Poetry of the 16th Century.* (3)
A study of the poetry of the Renaissance, its background, personalities, and achievements. Prereq: FR 601.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated once to a maximum of 6 credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

778 *Seminar—Main Currents of Romance and German Literatures.* (3) II
Studies of the principal works of the French, German and Spanish literature. Lectures, student reports. *Duncan, Server, Whitaker.*

780 *Special Studies in French.* (3) I, II, S
Selected studies and investigations in the French language and literature, permitting the student to work in areas of special interest, and providing opportunity for original endeavor. Prereq: Consent of instructor. May be repeated to a maximum of six credits. *Staff.*

GEOGRAPHY

The doctoral program at Kentucky provides specialization in the following specific areas of the discipline within the three subfields of geography listed earlier in the graduation program: *Theoretical Geography*—basic geometric theorems of point, line and area patterns; the analysis of general economic phenomena and processes with emphasis on location theory; *Population and Social Systems*—demographic behavior in spatial systems; human fertility, mortality, and migration; demographic models; spatial diffusion processes; settlement patterns; urban systems; *Remote Sensing*—problems of acquiring and interpreting spatially oriented data from remote sensors; geographic analysis of imagery from microwave, infrared photography, radar, laser or other data sources; pattern and configuration recognition systems; *Network Analysis*—spatial structure of transportation and circulation systems; commodity flow analysis, interaction theorems and linkage analysis; transport networks and graph theoretic structures; *Theoretical Cartography*—Map transformations; computer graphics; mapping spatial perception and behavior; *Political Geography*—studies of regional and national power settings; boundary problems; territorial behavior and perception; impact of space on politics and political impress upon space;

spatial political integration and disintegration; quantitative methods for analysis of spatial political processes and structures.

The topical fields emphasizing dynamic spatial patterns, processes, behavior, and relationships receive particular attention in regional geographic specializations of faculty in Appalachia, the Indian Subcontinent, Southeast Asia, Western Australia, and the Middle East.

Applicants for the Ph.D. in geography must conform to the general requirements of Graduate School as set forth in the first part of this *Bulletin*. Although there is no specific course work required in the Ph.D., the program consists of (a) core courses in the theory and methodology of geography, (b) formal course work, independent study and directed research in one of the specific fields noted above, (c) successful examination in one modern foreign language, (d) a dissertation based on original research.

Core courses in theory and methodology of geography consist of Geography 610, Geography 700, Geography 710, Geography 770, Geography 771, and Geography 775.

THE DEGREE OF MASTER OF ARTS IN GEOGRAPHY

Work for the M.A. degree in geography consists of:

(1) the completion of a group of required core courses (12 hours) in basic geographic theory, quantitative techniques and methodology necessary to the professional geographer;

(2) additional elective courses in geography (6 hours) and cognate disciplines (6 hours) according to the student's career objectives such as (a) research analyst in geography with a private firm or governmental agency, (b) university or college teaching, (c) international development or intelligence work; and (d) specific professional work in an Agency for Urban, Community, or Regional Development;

(3) the completion of a Master's thesis. At the discretion of the Department a non-thesis degree (Plan B) may be permitted on the student's background and career objective.

All M.A. students must pass *one* foreign language. The M.A. student may not take *more than six hours* of course work below the 600 level. The student is expected to demonstrate skill in critical analysis, scientific abstraction and accurate verbalization as part of his degree requirement.

520 *Regional Geography of Anglo-America.* (3) I, S

A regional study of the physical, economic, and cultural characteristics of the various areas of the United States, including Hawaii and Alaska. Prereq: One geography course. *Withington.*

522 *Geography of Kentucky.* (3) II, S

A study of how the people of Kentucky adjust themselves to the location, surface, climate, and other natural resources of their state. Prereq: One geography course. *Field.*

524 *Regional Geography of Latin America.* (3) I

Study of the countries and geographic regions of Mexico, Central America, and South America. Prereq: One geography course. *Staff.*

526 *Regional Geography of Europe.* (3)
A study of Western Europe's major geographic regions, climate, soil, terrain, mineral, and biotic factors. Population problems, economic adjustments, and political significance of resources. Prereq: One geography course. *Staff.*

528 *Regional Geography of Asia.* (3) I
A regional study of the countries of Asia including European U.S.S.R., China, Japan, and India. Role of the Orient in the international landscape. Prereq: One Geography course. *Karan.*

530 *Intermediate Field Studies.* (3) S
An intensive study of a particular geographic area with emphasis on such specific skills as filling in a base map and recording data for map composition and report. May be repeated to a maximum of six credits. *Karan.*

534 *Regional Geography of Australia and the Pacific Islands.* (3) I
A study made of the geographic problems and adjustments of the peoples and countries of the Pacific area. Reference to the strategic nature of the location. Prereq: One geography course. *Field.*

536 *Regional Geography of Africa.* (3) II
A study of Africa as a complete continent and not as an example of European imperialist policy; as a series of geographic regions. Prereq: one course in Geography. *Field, Albaum.*

538 *Geography of Natural Resources and Resource Development Problems.* (3)
A study of the distribution and management of particular resources, resource development problems in specific regions. Estimation of resource availability, tools for determining economic efficiency, the influence of institutional constraints on resource development, and the role of perception and attitudes in decision making related to man's use of natural resources. Prereq: GEO 255. *Withington.*

540 *Geography of Urban Areas.* (3) I
A study of the location and growth of cities and urban areas in relation to environmental factors. Prereq: GEO 255 or consent of instructor. *Withington.*

542 *Political Geography.* (3) I
A study of politico-geographic phenomena in their areal context, such as the analysis of boundaries, geographical patterns resulting from the application of governmental authority, the political viability of state units, and the spatial (territorial) variations and interrelationships of political activities and systems. *Karan.*

544 *Climatology.* (3) II
A study of the elements and controls of climate and of world climatic patterns. Prereq: GEO 151 or consent of instructor. *Staff.*

545 *Independent Work in Geography.* (3) I, II, S
Individual research involving such problems as: (a) materials and methods in teaching geography; (b) the historical evolution of geography; (c) map reading and interpretation; (d) special area studies; (e) other topics may be elected by consent of instructor. Prereq: Major and a standing of 3.0 in the department. May be repeated to a maximum of six credits. *Staff.*

547 *Cartography.* (3) I
A course in the construction and interpretation of maps. Prereq: GEO 151. *Field.*

550 *Regional Geography of South Asia.* (3) II
A regional study of India, Pakistan, and the Himalayan Kingdoms with emphasis on politico-geographic, and socio-economic problems of the countries in the region. Prereq: GEO 151, 152 or 255, or permission of instructor. *Karan.*

552 *Regional Geography of Southeast Asia.* (3) I
A study of the Southeast Asia region (between India-Pakistan to the west; China to the north; and Australia to the south) focusing on the politico-geographic, socio-economic, and resource potential problems of its countries. Prereq: GEO 151, 152 or 255, or permission of instructor. *Withington.*

560 *Regional Geography of the Caribbean.* (3) II
A regional study of Central America and the West Indies. Prereq: GEO 151, 152 or 255, or permission of instructor. *Staff.*

610 *Seminar in Theoretical Geography.* (3) I
A systematic review of the theoretical nature and character of geographic patterns with the use of mathematics. Application of geometry, primarily topology, to probe the geographic concept of spatial relation, spatial arrangements and spatial processes. Three class hours per week. Prereq: MA 521 or equivalent. *Blome.*

615 *Urban Climatology.* (3)
Study of the distributions of temperature, precipitation, and air pollutants in and around cities; the effect of cities on local heat and water budgets; relation between topographic situation and city climate. Prereq: GEO 151 and 544 or consent of instructor.

625 *Regional Theory.* (3)
The concept of regional structure and its application to geographic problems, modes, linkages, circulation, and regions. Methods of regional research and analysis in geography. Prereq: GEO 255 or equivalent or consent of instructor.

635 *Fundamentals of Remote Sensing of Environment.* (3)
A systematic study of the application of remote sensors in geographic investigation with particular reference to integrated landscape analysis, land use classification, cluster analysis, and multisensor survey of physical environments. Prereq: GEO 547 or equivalent or consent of instructor.

640 *Transportation Geography.* (3)
Conceptual and descriptice study of transport facilities and patterns of movement with special reference to the influence of geographic factors in the creation, transformation, and maintenance of transportation forms and functions; the bearings of transportation on urban and regional development and on industrial location; its role as an "organizing force" in economic geography, interaction of transportation, and regional development in different areas of the world. Prereq: GEO 255 or equivalent, or consent of instructor.

643 *Urban Transportation Planning.* (3) I
A detailed review of the transportation planning process; inventory methodologies; trip generation, distribution and assignment with associated mathematical models and theories; prediction of future travel; land and use models; modal split; developing and testing proposed systems; simulation. Three class hours per week. Prereq: CE 543 or equivalent and MA 521, AEC 630 or equivalent statistics course. (Same as CE 643.)

648 *Applied Cartography.* (3)
An analysis of cartographic presentation including mapping of areal relationships, and studies of the ways in which designs and scales of maps can influence the portrayal of geographical patterns and associations. *Field.*

650 *Regional Study of Special Areas.* (3) I, II, S
The application of the methods of regional interpretation to special areas such as the U.S.S.R., Mediterranean Basin, Caribbean Region, Mexico, Central Europe, etc. May be repeated once. Prereq: A prior major or minor in Geo. or consent of instructor. *Staff.*

652 *Soil Classification and Geography.* (3)
A critical evaluation of the concepts of soil classification, with particular reference to the current U.S. scheme. Study of geographic locations and the nature of their soil associations as related to gross considerations of soil genesis. (Same as AGR 652.) Prereq: AGR 573, 581, or consent of instructor.

655 *Special Study of Systematic Geography.* (3) I, II, S

The application of the methods of systematic geography to particular special studies in topical areas, such as conservation, urban areas, climatology, cartography, or others. May be repeated for a total of 6 credits. Three class hours per week. Prereq: Appropriate 500-level course work in Systematic or Topical Geography (e.g., Conservation, Urban, Climatology, Cartography.) *Staff.*

660 *Advanced Field Studies.* (3) S

Field study and preparation of a report which shall include both manuscript and graphic material. This field study will be based upon the work done in the field of GEO 530, but will be carried forward to include the more difficult problems of preparation of graphic material, map composition, and manuscript preparation, such as later can be used in thesis preparation and publication. Prereq: GEO 151, 547 or 548 and 530 for Geo. students or consent of instructor for students offering field experience in allied subjects, such as Geology. May be repeated once to a maximum of 6 credits. *Karan.*

700 *Quantitative Methods in Geography.* (3) II

A survey of the applications of quantitative techniques to geographical problems, with emphasis on the use of models in current geographic literature. Special emphasis will be given to the interpretation of recent findings in physical, urban, economic, and regional geography, and in the preparation of the student for the further use of certain techniques in his own research. Three class hours per week. Prereq: An elementary course in statistical methods. *Blome, Albaum.*

710 *Research Problems in Geography.* (3)

A comprehensive review of the problems involved in designing geographical research, planning field work, analysis of data, and in writing geographic reports. Alternate fall or once a year as required. Prereq: GEO 545 or equivalent. *Karan.*

715 *Seminar in Systematic Geography.* (3)

Urban geography; population geography; political geography; transportation geography. (Sub-field will be chosen in keeping with the interest of the professor in charge). May be repeated for a total of 12 credits. Prereq: Appropriate 500-level systematic course or consent of the instructor.

750 *Applied Geography in Developmental Analysis.* (3)

A systematic review and critical evaluation of the application of geographic concepts and methods of survey, analysis and interpretation in the study of regional developmental problems with particular reference to the developing nations and underdeveloped areas in the United States, Canada, and Europe. (Alternate fall semesters.) Prereq: GEO 545 or equivalent. *Karan.*

760 *Seminar in Regional Geography.* (3)

Australia, Southeast Asia; Himalaya and Central Asia; other world regions in keeping with the regional specialization of the professor in charge. May be repeated twice for a total of nine credits. Prereq: Appropriate 500-level course in regional area, or consent of instructor.

762 *Seminar in the Geography of Anglo-America.* (3)

Research seminar in topics or problems related to geographic aspects of Anglo-America. Topics will be chosen in keeping with the interest of the professors in charge. May be repeated for a total of six credits. Three class hours per week. Prereq: at least one year of graduate study in geography.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1-12 credits equivalence)

May be repeated indefinitely.

770 *Seminar—Development of Geographic Thought.* (3) II
Series of topics selected in order to acquaint the graduate student of geography or of related subjects with the basic literature and evolution of the broad field of geography. Prereq: Geography major or consent of instructor. *Staff.*

771 *Advanced Seminar in Geography.* (3)
The study of selected topics or current systematic concepts in geography. For Ph.D. candidates. May be repeated to a maximum of nine credits. Three class hours per week. Prereq: Consent of instructor.

772 *Special Research Problems in Geography.* (3)
Open to doctoral candidates who have the necessary training and ability to conduct research on a selected problem. May be repeated for a total of 12 credits. Prereq: approval of director of graduate studies.

775 *Spatial Models in Geography.* (3)
The spatial aspects of models in geographic research are examined with reference to economic, urban geography, settlement pattern, industrial location, and agricultural activity. May be repeated for a total of nine credits.

GEOLOGY

The Department of Geology offers graduate work leading to the M.S. degree under Plan A (see p. 22), and the Ph.D. The credentials of each applicant are considered individually and applicants from disciplines other than geology are encouraged to apply. Prospective students should have a good background in basic science and demonstrated competence at the undergraduate level. Deficiencies in geology and allied sciences must be removed by such course work as the department may specify. Each candidate is expected to have or obtain practice in geological field work and teaching, demonstrate acceptable reading ability in one (M.S.) or two (Ph.D.) foreign languages, and must submit an acceptable thesis which demonstrates his ability to conduct sound research.

The principal fields of study offered are mineralogy-petrology, geochemistry, sedimentology-stratigraphy and paleontology, but other fields are available and interdisciplinary studies are encouraged.

Resources for the conduct of advanced studies in the way of reference collections, an outstanding library, well-equipped laboratories including the Cabot Spectrographic Laboratory facility, sample preparation and field equipment are available within the department. The laboratory apparatus includes x-ray fluorescence and diffraction, atomic absorption and spectrophotometry, dc arc and laser microprobe emission spectrography, petrographic microscopy, and special equipment for sedimentologic and paleontologic studies, clay mineralogy, and rock mechanics. Additionally, such extra-departmental facilities as computing, neutron activation, electron microscopy, and portable diamond drilling are readily available.

401 *Paleontology.* (3) I
A study of fossil invertebrates, their nature, classification, and geological distribution. Lecture, two hours, two hours laboratory per week. Prereq: GLY 142. *Campbell.*

420 *Elementary Structural Geology.* (3) I
An introduction to earth structures. Advanced geological map interpretation. Prereq: GLY 142; PHY 213. *Nelson.*

424 *Field Work in Regional Geology.* (7)
Eight weeks in the field in Colorado. This course is an effort to bring the student into contact with diverse geological phenomena and problems. Geological field methods. See special announcement. Required of major students at the end of junior year.

426 *Field Work in Regional Geology—Report.* (1)

445 *Advanced Principles of Geology I.* (4)
A general study of geologic processes, designed primarily to meet the needs of advanced students with backgrounds in other fields.

446 *Advanced Principles of Geology II.* (4)
A general study of earth history and the history of life on the earth, designed primarily to meet the needs of advanced students with other than geologic backgrounds. Lecture, three hours; laboratory, two hours per week. Prereq: GLY 445 or equivalent.

450 *Stratigraphy and Sedimentation.* (3) II
Basic principles and concepts of stratigraphy and sedimentation. Lithologic correlation and the interpretation of geologic history and paleogeography. Field and laboratory analysis of sedimentary rocks including megascopic and microscopic methods. Two class hours per week; laboratory, two hours per week. Prereq: GLY 142. *MacQuown.*

460 *Elementary Mineralogy.* (4) I
A study of fundamentals of mineralogy including crystallography, occurrence and identification of common and abundant minerals. Two class hours per week; lab, four hours per week. Prereq: CHE 112 or concurrent. *Fisher.*

461 *Elementary Petrology.* (3) I
The elementary study of igneous, sedimentary, and metamorphic rocks. Prereq: GLY 460. *Fisher.*

501 *Stratigraphic Paleontology.* (3)
The use of fossils and fossil assemblages for zonation and correlation; and the problems arising from the application of this method as illustrated by specific examples. Practice in the analysis of sample invertebrate faunas for purposes of correlation. Lecture, two hours per week; lab, two hours. Prereq: GLY 401, 450. *Campbell.*

510 *Economic Geology.* (4) II
Mineral deposits other than petroleum and natural gas. Distribution, mode of occurrence, origin, methods of search for, and uses. Lecture, 3 hours, lab, 2 hours. Prereq: GLY 142, 460. *Brown.*

511 *Petroleum Geology.* (2) I
The origin and accumulation of petroleum and natural gas. A study of geological methods used in exploratory work. Geology of the principal producing fields. *Roberts.*

520 *Advanced Field Geology.* (2) I, II
A field course in geological mapping involving problems of local structure and stratigraphy. Six hours a week in the field. Prereq: GLY 226. *Nelson.*

530 *Low Temperature Geochemistry.* (3)
An introduction to the geochemistry of sediment deposition and diagenesis, weathering, and other topics in aqueous geochimistry. Three lectures per week. Prereq: GLY 461, MA 114, or consent of instructor. *Thrailkill.*

531 *Geochemistry of Igneous and Metamorphic Processes.* (3)
A discussion of the processes and principles of chemistry as they apply to the mineralogic and petrologic problems associated with the formation of igneous and metamorphic rocks. Prereq: GLY 530. *Blackburn.*

552 *Sedimentary Petrology.* (3)
Detailed description of sedimentary rock types, their origins and classifications. Megascopic and microscopic examination of testures and structures of sediments. Mineralogy of sediments and the significance of sedimentary environments. Two class hours per week and two lab hours per week. Prereq: GLY 450.

560 *Optical Mineralogy.* (3) I
A study of the optical properties of minerals by means of the petrographic microscope. Prereq: GLY 460, PHY 213. *Brown.*

562 *X-Ray Mineralogy.* (3)
The use of x-ray diffraction and spectroscopy in the qualitative and quantitative analysis of minerals and rocks. Emphasis will be placed upon the rock-forming minerals. One class hour per week. Laboratory, four hours per week. Prereq: GLY 461, PHY 213.

570 *Geology Seminar.* (1)
Reading and discussion of classical and contemporary books and papers having relevance to geology, varying in scope and content to meet the special needs and interest of the participants. May be repeated to a maximum of four credits. Prereq: GLY major with junior standing. *Staff.*

612 *Advanced Economic Geology.* (3) I
Lecture, two hours; laboratory, two hours. *Nelson.*

620 *Structural Geology.* (3) II
A study of the structural features of the earth's crust with an analysis of the mechanics involved. Three lectures, or two lectures and two laboratory hours per week. Prereq: PHY 211, 213, GLY 420. *Nelson.*

650 *Sedimentology.* (3)
The classification and interpretation of sedimentary rocks, and study of sedimentary processes. Prereq: GLY 450. *Roberts.*

652 *Stratigraphy I.* (3)
Regional stratigraphy with emphasis on field relationships in Kentucky and stratigraphic equivalence of Paleozoic rocks in North America. Lecture, two hours; lab, two hours. Prereq: GLY 450. *MacQuown.*

653 *Stratigraphy II.* (3)
Regional stratigraphy with emphasis on world-wide stratigraphic equivalence and Mesozoic and Cenozoic rocks. Lecture, two hours; lab, two hours. Prereq: GLY 450. *MacQuown.*

655 *Hydrogeology.* (3)
A study of hydrologic processes and systems in geology, including topics in fluvial geomorphology and groundwater flow. Prereq: GLY 552 or consent of instructor.

662 *Petrology of the Igneous Rocks.* (3)
The occurrence, origin and classification of igneous rocks. Identification with the petrographic microscope. An introduction to metamorphic rocks. Lecture, one hour; laboratory, four hours. Prereq: GLY 460, 560 and consent of instructor.

664 *Petrology of Metamorphic Rocks.* (3)
The conditions of metamorphism. The occurrence, classification and origin of metamorphic rocks. Metamorphic differentiation and equilibrium relations in metamorphic rocks will be discussed. Two class hours; two laboratory hours per week. Prereq: GLY 460, 560 and consent of instructor.

710 *Mineral Exploration.* (1)
Techniques and applications of mineral exploration. Oreguides, sampling patterns and techniques, evaluation of data and related topics. One class hour per week. Prereq: GLY 612.

711 *Evaluation of Mineral Properties.* (1)
Procedures in property evaluation. Tonnage and grade calculations, political and economic factors, and related topics. One class hour per week. Prereq: GLY 612.

720 *Mesoscopic Structures.* (3)
The analysis of structures of mesoscopic scale in deformed rocks, particularly metamorphic tectonites and their extrapolation to larger structures; also the study of certain mesoscopic features in igneous rocks and features in sediments useful in basin analysis and the determination of chronologic sequence and environment of deposition. Two class hours; two laboratory hours per week. Prereq: GLY 552 and 620 or consent of instructor.

730 *Graduate Geology Seminar.* (1)
Discussion of current research or advanced topics in geology and related fields. Subject matter will vary from term to term. May be repeated to a maximum of six credits. Prereq: Geology major with graduate standing. *Staff.*

732 *Advanced Low-temperature Geochemistry.* (3)
Topics in low-temperature and aqueous geochemistry. Seminar involving review of current literature and laboratory investigation of significant geochemical problems. Two class hours, two laboratory hours per week. Prereq: CHE 442, GLY 530 and 650, or 652, or consent of instructor.

733 *Petrologic Geochemistry.* (3)
Application of thermodynamics to geological problems, melt and aqueous equilibria, phase transitions and the geochemical differentiation of igneous and metamorphic rock systems. Prereq: CHE 442, GLY 530, 531 and either GLY 662 or 664 or consent of instructor. Offered in alternate years. *Blackburn.*

760 *Petrology Seminar.* (2)
Review of classic works and recent developments in important and controversial aspects of igneous and metamorphic petrology. Prereq: GLY 662, 664 or consent of instructor.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence.

782 *Individual Work in Geology.* (3)
Problems involving independent laboratory and/or library study conforming to the student's special interest under the direction of an appropriate staff member having proficiency in the area selected. May be repeated for a total of 9 credits. Prereq: Geology major with graduate standing. *Staff.*

GERMANIC LANGUAGES AND LITERATURE

A fundamental goal of language study is to broaden and deepen acquaintance with the world by revealing aspects of its cultures, old and new. Following the idea that this goal is primarily accessible through study of the pertinent languages and literatures, the department emphasizes German in the graduate program. Supporting work in Scandinavian is offered. The faculty is concerned with the development and encouragement of an understanding of linguistic, humane, and critical concepts.

Graduate programs leading to the M.A. (Plan A or Plan B) and Ph.D. in German are offered. Competence in German plus French or another foreign language are required for graduate degrees.

Admission requirements include an acceptable undergraduate major in German and a satisfactory score on the Graduate Record Examination.

Individual programs of study are planned with consideration of the student's competencies and interests. Thus, desiderata for teacher preparation are flexible and accommodate particular emphases appropriate for secondary schools or for two-year or four-year colleges. Likewise, suitable credit for studies successfully completed abroad is recommended.

Areas of specialization of the graduate faculty of the department afford flexible coverage in breadth and depth, with particular strength in medieval linguistics and literature. The library has basic serial holdings in all areas of German language and literatures and supporting fields. Special collections include German drama on microcard and folklore on microfilm, a selection of Danish literature to 1900, and German books printed before 1600 on 35mm microfilm.

The department serves as a publishing center for Germanic studies. Under the aegis of the University Press of Kentucky it sponsors a monograph series in the Germanic languages and literatures. Other publications are *Colloquia Germanica*, *Germanic Notes*, and *Lyrica Germanica*. Lectures and extracurricular activities are provided, including the annual Kentucky Foreign Language Conference. Electronic facilities in support of the instructional program include a departmental tape library focusing on German cultural materials.

Students holding appointments as supervised teaching assistants take about four semesters to complete requirements for MA degree and teach two basic or intermediate sections per semester. Those students devoting full time to graduate studies complete the MA degree in about three semesters. Those who hold teaching assistantships and fellowships are not required to pay out-of-state fees. Appointments may be renewed. Summer offerings make it possible to obtain the MA degree through several semesters of summer study.

GERMAN

412 *Modern German Literature in Translation.* (3) I, II

A study in depth of the authors' artistic development and of the structure and content of their major works. Authors treated are novelists Kafka, Hesse, and Mann or dramatists Brecht, Frisch, and Durrenmatt. The course is conducted in English and may be repeated for a total of six hours. Three class hours per week.

520 *Germanic Proseminar.* (3) I, II, S

The proseminar is designed primarily to introduce graduate or advanced undergraduate students into the methods of scholarly research based upon the study of a specific area of Germanic language or literature. Topic will vary, and will be announced. Representative components which may be treated in this course are Lessing, Schiller, Goethe, Buchner, Kleist, Grillparzer, Hebbel, Hauptmann, 18th (19th, 20th) century prose narrative, 18th (19th, 20th) century drama, semantics, and expressionism. Three class hours per week. Prereq: GER 205-206 and 9 additional hours of German beyond GER 222. The course may be repeated for a total of twelve hours. *Staff.*

532 *The German Lyric.* (3) II

An intensive study of the German lyrical poem from the Age of the Baroque to the present. Prereq: Six semesters of German. *Wonderley.*

534, 535 *Life and Works of Goethe.* (3 ea.) I, II, S

This course follows the unfolding of Goethe's genius from his first lyrics through Faust. His principal literary works will be read and attention devoted to autobiographical material, letters and diaries. Prereq: Six semesters of German. *Staff.*

536 *Introduction to the History of the German Language.* (3) I
This course in Germanic Philology acquaints the student with the position of German in the European language group and traces the development of the language to the present. Special emphasis is given to the relationship of German and English words. Prereq: Six semesters of German. *Binger.*

537 *Introduction to Middle High German.* (3) II
This is a literary course with a necessary minimum of Middle High German grammar. Selections will be read from epic and lyric poetry of the period and reports will be given on assigned topics. Prereq: Six semesters of German. *Binger.*

538 *Advanced German Conversation and Composition.* (3) I, II
This course is primarily for German majors. It involves intensive practice in the writing of German prose, with some review of German grammar. Prereq: Six semesters of German. *Riester.*

539 *Structure of the German Language.* (3) II
An introduction to the phonology, morphology and syntax of modern German by means of concepts and methods of linguistic science. Prereq: Six semesters of German or permission of instructor. *Kratz.*

553 *The Teaching of German.* (3) II
The course is designed for teachers and prospective teachers of the language. Theory and practice, with emphasis upon modern methodology and practical problems encountered by the teacher of beginning German. Prereq: GER 222, 205, and 206 or equivalent. Required of graduate students in German. *Riester.*

621 *Introduction to German Bibliographical Studies.* (2) I
An introduction to bibliography, original research, and textual criticism. Prereq: Six semesters of German. Required of graduate students in German.

622 *Theories of Literature in German.* (2) II
An introduction to theories of literature with emphasis upon those of Germany and continental Europe.

623 *Medieval German Literature.* (3) I
A survey of the literature of the Middle High German period, with special attention to one major genre or author, and involving extensive readings in the texts of the period. Prereq: GER 537. *Staff.*

624 *German Literature of the 16th and 17th Centuries.* (3)
A survey of the major literary documents of the German Reformation, Renaissance, and Baroque, with special attention given to one period, and involving extensive readings in the texts of the period. *Staff.*

625 *German Literature of the 18th Century.* (3) I
A survey of the literary themes and forms of the *Aufklärung* and *Sturm und Drang*, with special emphasis on selected aspects of German letters of the period 1700-1775. *Staff.*

626 *The Age of Goethe (1770-1830).* (3) II
A seminar devoted to the investigation of one or more topics in the literature and social development of Germany during the period 1770 to 1830. *Staff.*

627 *German Drama of the 19th Century.* (3) I
This course is a study of the German Drama from Schiller's "Die Braut von Messina" to 1870. Prereq: Six semesters of German. *Whitaker.*

628 *The German 'Novelle.* (3) II
This course traces the origin and development of the German Novelle from Goethe to Thomas Mann. Prereq: Six semesters of German. *Whitaker.*

630, 631 *20th Century German Literature.* (3 ea.) I, II
Extensive readings, discussions and comprehensive reports on the leading literary minds and movements of this century. Prereq: Six semesters of German.

635 *Gothic.* (3) I
Readings; phonology and morphology of Gothic. Prereq: Reading knowledge of German and GER 536, or consent of instructor. *Kratz.*

636 *Old High German.* (3) II
Readings; phonology, morphology, and dialects of Old High German. Prereq: Reading knowledge of German and GER 536, or consent of instructor. *Kratz.*

640 *Studies in Germanic Language and Literature.* (3) I, II, S
Exploration in some depth of a theme, genre, author, or period. Topic will vary, and will be announced. Representative components which may be treated are earlier German literature, medieval epic, medieval German lyric, early New High German language and literature, late romanticism, idealism, realism, naturalism, impressionism, expressionism, symbolism, textual criticism, historical linguistics, structure of modern German, dialectology. The course may be repeated for a total of 12 credits with the approval of the Departmental director of graduate studies. *Staff.*

768 *Residence Credit for Master's Degree.* (0)
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for Doctor's Degree.* (0)
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

778 *Seminar—Main Currents of Romance and German Literatures.* (3)
Studies of the principal works of the French, German and Spanish literature. Lectures, student reports. *Staff.*

781 *Special Studies in German.* (3) I, II, S
Selected studies and investigations in the German language and literature, permitting the student to work in areas of special interest, and providing opportunity for original endeavor. May be repeated to a maximum of twelve credits. *Staff.*

790 *Germanic Seminar.* (4) I, II, S
Topic to be selected from a Germanic literary or linguistic area. The seminar may be repeated for a total of 12 hours with the approval of the Departmental director of graduate studies. *Staff.*

SCANDINAVIAN

500 *Swedish.* (alternate years in fall) (3)
Rapid coverage of morphology, phonology and syntax of modern Swedish and reading of selected literary texts. Prereq: Reading knowledge of German; consent of instructor. Three class hours per week. *Staff.*

501 *Swedish Literature from Bellman to the Present.* (3)
(alternate years in spring)
Readings in Swedish Literature of the period. Prereq: GER 500. Three class hours per week. *Staff.*

504 *Danish.* (alternate years in fall) (3)
Rapid coverage of morphology, phonology, and syntax of modern Danish and reading of selected literary texts. Prereq: Reading knowledge of German; consent of instructor. Three class hours per week. *Staff.*

505 *Danish Literature from Holberg to the Present.* (3)
(alternate years in spring)
Readings in Danish Literature of the Period. Prereq: GER 504 or equivalent. Three class hours per week. *Staff.*

610 *Old Icelandic.* (3) I
Rapid coverage of morphology, phonology and syntax of Old Icelandic, with some attention to linguistic affinities within the Indo-European and Germanic groups of languages. Prereq: Reading knowledge of German; consent of instructor. *Thompson.*

611 *Old Icelandic.* (3) II
Reading of selected saga texts and Elder Edda, with attention to the development of Icelandic literature from the Tenth Century to the present. Prereq: GER 610. *Thompson.*

HISTORY

THE MASTER'S PROGRAM

Students should submit evidence of strong undergraduate preparation in history, preferably an undergraduate major with a minimum grade point average of 2.8 on a 4.0 scale. Background in at least one modern foreign language is required for admission. No person will receive the M.A. degree in history unless he demonstrates reading knowledge of a modern foreign language approved by the Department of History and by the Graduate School.

The M.A. degree in history may be obtained by Plan A or Plan B.

Under Plan B, the student must complete 36 credit hours. Of the minimum 15 hours in courses above the 500 level, at least six will be in courses of the 700 category. The decision whether a student will follow Plan A or Plan B normally is not made until he has completed the equivalent of at least one semester of full-time graduate study.

The Final Master's Examination under both plans is oral. The Master's Committee has the authority (1) to fail the student, (2) to pass the student and to decide that the master's degree will be terminal, or (3) to pass the student and permit him to continue toward the doctoral degree at the University of Kentucky.

THE DOCTOR OF PHILOSOPHY PROGRAM IN HISTORY

Those who seek the doctorate in history should follow carefully the general directions governing the subjects of residence, courses, and foreign language requisites set forth in the first part of this *Bulletin*. The applicant does not become a candidate until he has demonstrated reading knowledge of two modern foreign languages approved by his Special Committee, and until he has passed the Qualifying Examinations and has been approved by the Graduate School for candidacy for the degree.

The student's work for the doctorate in history is directed by a Special Committee composed of representatives of his areas and fields under three preparation requirements. (See below.) The committee's chairman directs the dissertation and the student should consult this person at his earliest convenience.

Requisites for the Ph.D. candidacy in history will be met as follows:

General Preparation: For the purpose of obtaining a sound factual and interpretative understanding to supplement his work in his fields, the student will pursue guided reading, research, and course work in *one* of the following *areas:*

I. Ancient History (Greek and Roman)
II. Early Middles Ages (c. 400-c. 1000)
III. Late Middle Ages (c. 1000-c. 1500)
IV. Early Modern Europe (1450-1770)
V. Modern Europe (since 1770)
VI. United States History
VII. Britain and the Empire (1485 to present)
VIII. Russia and East Europe
IX. The Far East
X. Latin America

As an alternative method of satisfying the *area* requirement, the student may opt an area entitled Western Civilization. This area will require 21 graduate hours of course work at the 500-699 level excluding History 606 but including six hours of Ancient History, six hours of Medieval History, and six hours of European History since 1500 (the last specification possibly including Russian and East European History). None of these hours may be in the student's intensive *fields.*

Intensive Preparation: The student will pursue guided reading, research and course work to obtain professional preparation in depth in *two* of the following *fields,* neither of which will duplicate the area chosen for General Preparation:

I. Renaissance and Reformation (to 1648)
II. Modern Europe (1600-1770)
III. Modern Europe (1770-1870)
IV. Modern Europe (1870 to present)
V. United States to 1865
VI. United States since 1865
VII. Britain and the Empire, 1485-1815
VIII. Britain and the Empire, 1815 to present
IX. Russia and East Europe, 1700-1890
X. Russia and East Europe, 1890 to present
XI. Hispanic America Since 1810

Specialty Preparation: The student will prepare himself in a third *field.* Requirements for this *field* may be satisfied in one of the following ways:

I. Achieving competence in some discipline other than history, but in one closely related to his major *field* of history.

II. Achieving mastery in a special *field* chosen from within the student's program of Intensive Preparation. Examples of such a *field* might be United States Intellectual History or the History of Germany. The special *field* will normally require course work or directed reading in one

or more outside disciplines. The choice of the special *field* will be initiated by the student and his major professor. Final acceptance will rest with the student's Special Committee.

The student's success in his General Preparation will be evaluated by a written examination. His success in his Intensive and Specialty Preparations is evaluated by both written and oral examinations.

I. EUROPEAN HISTORY

490 *Modern Europe.* (3)
This course is offered to meet a demand for a broader course which will equip students who are going out to teach European history in the present high school curriculum. Prereq: HIS 104 and 105.

500 *Pre-Classical and Classical Greece.* (3)
A history of Greece from earliest times to the death of Alexander the Great.

501 *Fourth Century Greece and the Hellenistic World.* (3)
A history of Greece and the Greek world from the death of Alexander to the Roman conquest of Egypt. Prereq: HIS 500 or consent of instructor.

502 *A History of the Roman Republic.* (3)
A history of Rome from earliest times to the fall of the Republic. Emphasis will be placed upon the territorial expansion of Rome and the effects of this expansion on republican institutions.

503 *A History of the Roman Empire.* (3)
A study of the foundation of the Roman Empire, the development of Imperial institutions, social and intellectual developments of the Graeco-Roman world, the decline of Rome and the barbarian invasions of the fourth century. Prereq: HIS 502 or consent of instructor.

510 *Medieval Civilization to 1100.* (3)
The formation of a new civilization—our own—in Western Europe between the decline of the Roman Empire and the First Crusade is the central stress in this study of the cultural interests and achievements of the period 300-1100. Prereq: HIS 270 or consent of instructor.

511 *Medieval Civilization Since 1100.* (3)
Medieval culture at its height (1100-1350) is considered as the first notable achievement of European Civilization. Major topics are: Latin and vernacular literatures, the fine arts, philosophy, and science.

512 *Medieval Institutions to 1049.* (3)
A survey of medieval political, social, economic and ecclesiastical institutions from the fourth century to the papal reform movement. (Alternating in the fall semester with HIS 510.) Prereq: HIS 270, 271.

513 *Medieval Institutions Since 1049.* (3)
A survey of medieval political, social, economic and ecclesiastical institutions from the beginning of the papal reform to the middle of the 15th Century. Prereq: HIS 270, 271.

519 *The Era of the Renaissance.* (3)
An historical description and analysis of the development of political, economic, social, religious, intellectual and cultural institutions of Europe from Petrarch to Erasmus. Prereq: HIS 104.

520 *The Era of the Reformation.* (3)
An historical description and analysis of the development of the religious, intellectual, cultural, political, economic and social institutions of Europe from Luther to the Treaty of Westphalia. Prereq: HIS 104.

521 *The Age of Absolutism.* (3)
A study of the development of absolute monarchies from Louis XIV; the European rivalries at home and abroad; benevolent despotism, and the Age of Enlightment. Prereq: HIS 104 or equivalent.

523 *Europe 1814-1870.* (3)
This course treats the successive political changes in 1823, 1830, 1848, and 1870, together with the outstanding commercial, cultural, and scientific developments of European life after 1815.

524 *Europe, 1870-1918.* (3)
A balanced treatment of the political, social, cultural, economic, and intellectual life of Europe in the period indicated. Special emphasis placed on diplomatic and military developments leading to the first World War.

525 *Europe since 1919.* (3)
A study of the origins and consequences of the two World Wars together with the revolutionary movements of fascism and communism and their challenge to liberal democracy.

528 *Cultural and Intellectual History of Europe from the Renaissance to the French Revolution.* (3)
An interpretive analysis of the growth of ideas in Europe within their cultural setting. Emphasis upon the 17th and 18th Centuries.

530 *Social History of Europe in the Eighteenth Century.* (3)
A study of the life and manners of the people of Europe in the 1700's. Special attention will be given to Western and Southern Europe.

531 *The French and European Revolutions, 1760-1795.* (3)
The origins, development, institutions, consequences, and interactions of the French and other European revolutions, counter-revolutions and wars and their impact upon France, Europe and the modern world. Presented in alternate years. Prereq: HIS 105 or equivalent.

532 *Napoleonic Europe, 1796-1815.* (3)
A study of France and her European neighbors during the epoch of Napoleon. Political, institutional, social, economic, cultural, religious and international conditions, relationships and changes are analyzed within the historical context of the period. Prereq: HIS 105 or equivalent.

534 *Russian Revolutions and the Soviet System I.* (3)
Study of the fundamental factors leading to the collapse of the monarchy, with emphasis upon the reforms and the governmental policies, their short-comings, and the pressures of discontent that generated revolutionary movements. Prereq: HIS 286 or graduate status or consent of instructor. Presented in alternate years.

535 *Russian Revolutions and the Soviet System II.* (3)
A continuation of 534, this course examines the ideological bases and *raison d'etre* of the Soviet state, before undertaking analyses of those conditions and policies which have molded the totalitarian system during the past four decades. Prereq: HIS 286 or graduate status or consent of instructor. Presented in alternate years.

536 *Intellectual and Cultural History of Russia and East Europe to 1890.* (3)
A study of the main intellectual currents with special emphasis on ideological confrontations between East and West Europe. Prereq: HIS 204 and 286.

537 *Intellectual and Cultural History of Russia and East Europe from 1890 to the Present.* (3)
Continuation of HIS 536. Prereq: HIS 204 and 286.

538 *The East European World from 1890-1920.* (3)
An intensive analysis of the problems which favored or frustrated (a) the modernization and national self-assertion of the East European peoples and (b) their consolidation into the Russian-led "Second World." Prereq: HIS 204.

539 *The East European World from 1920 to the Present.* (3)
Continuation of HIS 538.

540 *History of Modern France to 1815.* (3)
The course of French history to 1815, including the development of French political, administrative, legal, social, economic and cultural achievements and institutions and their contribution to the modern world. Prereq: Permission of instructor.

541 *History of Modern France Since 1815.* (3)
Continuation of History 540.

542 *German History, 1815-1914.* (3)
This course is designed as a study of domestic development in Germany. While political history is emphasized, due consideration is given to social, economic and intellectual trends. Prereq: HIS 104, 105 or consent of instructor.

543 *German History Since 1914.* (3)
Examines the fall of Imperial Germany, the Weimar Republic, Hitlerian period, and the post 1945 era. The course is primarily concerned with internal affairs, but attention is directed to the international scene when crucial. Prereq: HIS 104, 105 or consent of instructor.

544 *A History of Italy 1789-1890.* (3)
An examination of the developments leading to Italian unification and analysis of the problems faced during the united states' first 20 years. Prereq: HIS 104-105.

545 *A History of Italy, 1890 to the Present.* (3)
A continuation of HIS 544, this course will deal with political, economic, social and cultural developments in Italy since 1890, including an examination of Fascism and post-World II Italy. Prereq: HIS 104-105.

547 *The Byzantine Empire.* (3)
A study of Byzantine history from the time of Constantine the Great to the capture of Constantinople by the Turks in 1453. Prereq: HIS 104 and 247, or consent of instructor.

548 *The Ottoman Empire.* (3)
The rise and expansion of the Ottoman Empire, its relationships with the European States, its position in the Near East, and the Turkish State in the 20th Century. Prereq: HIS 104-105 and 247-248, or consent of instructor.

549 *Independent Work.* (1-3)
Under special conditions selected students may investigate problems, with weekly reports to the instructor. May be repeated for a maximum of 6 credits. Prereq: Major and standing of 3.0 in department.

II. ENGLAND AND THE BRITISH EMPIRE

550 *English Constitutional History to 1603.* (3)
A study of the backgrounds of the English constitution. Prereq: HIS 202 or equivalent.

551 *English Constitutional History since 1603.* (3)
A continuation of HIS 550. The constitutional struggle between the Stuart kings and Parliament; triumph of constitutional monarchy; rise of the Cabinet; effect of democracy in recent times. Prereq: HIS 203 or equivalent.

552 *British Social History During the Tudor Period, 1485-1603.* (3)
A study of British life, manners, and customs in town and country. Particular emphasis will be placed upon the age of Elizabeth, with political events subordinated to social changes. Prereq: HIS 202.

554 *British History 1815-1901.* (3)
A detailed study of Britain's political, social, diplomatic and industrial development in the nineteenth century.

555 *British History Since 1901.* (3)
A detailed study of Britain in the twentieth century with special consideration of Britain in World War I and World War II, and her position in the contemporary world.

556 *The British Empire to 1860.* (3)
Origin of the British Empire, 1783 to 1860; development of British sea power; the early growth and development of Canada, Australia, New Zealand, South Africa, and India.

557 *The British Empire and Commonwealth.* (3)
A continuation of HIS 556. Great Britain and the growth of the Dominions and the Commonwealth since 1860. Prereq: HIS 202, 203.

558 *History of Canada.* (3)
A brief survey of Canada under the French; the development under British control; evolution of the Dominion; relation with the United States and British Commonwealth of Nations. Prereq: One year of college history.

III. AMERICAN HISTORY

560 *Colonial America to 1748.* (3)
A study of the origins and development of the English colonies; their relations with England and European states. Emphasis on imperial policies and colonial autonomy. Prereq: One year of American or European History.

561 *Colonial America and Independence, 1748-1789.* (3)
This course deals with America's triumph over France in the New World, the drastic change in her colonial policy, and the rise of opposition to it, the war for American independence, and the establishment of the United States under the Constitution. Prereq: One year of American or European history.

562 *The New Nation, 1789-1828.* (3)
An intensive study of the most significant men, events, and trends in the first generation of American national growth. Prereq: HIS 108.

563 *Expansion and Conflict, 1828-1865.* (3)
A study of the territorial expansion of the United States and the growth of sectional controversy over expansion and slavery, culminating in the Civil War. Prereq: HIS 108, 109.

564 *Emergence of Modern America, 1865-1912.* (3)
A study of the transformation of America from a rural society "isolated" from world affairs into a highly industrialized power. Prereq: HIS 108 and 109 or equivalent.

565 *Recent History of the United States, 1912-1939.* (3)
An intensive study of the problems of maturing America from the election of 1912, through World War I, depression, and the New Deal to our involvement in World War II. Prereq: One year of American History.

566 *Recent History of the United States Since 1939.* (3)
An intensive study of the development and maturation of the United States from World War II to the present synthesizing military, diplomatic, social, economic, political and cultural changes. Prereq: One year of American History.

568 *Cultural and Intellectual History of the United States to 1865.* (3)
An interpretive analysis of the growth of ideas in the United States within their cultural setting before 1865. Prereq: HIS 108 or consent of instructor.

569 *Cultural and Intellectual History of the United States Since 1865.* (3)
An interpretive analysis of the growth of ideas in the U. S. within their cultural setting since 1865. Prereq: HIS 109 or consent of instructor.

570 *Economic & Social History of the U.S., 1787-1900.* (alternate years) (3)
The emergence of the United States from an underdeveloped economy to an industrial state. Interwoven in the theme of economic growth are the social ramifications of change and the role of government in American economic activity. Prereq: HIS 108 and 109 and ECO 260 and 261 or consent of instructor.

571 *Economic and Social History of the U.S.—20th Century.* (alternate years) (3)
Emphasis is placed on 20th century economic and social changes caused by technology, internal and external business modifications, the growing affluence of the U.S., and, most importantly, the increasing role of government in American society. Prereq: HIS 108 and 109 and ECO 260 and 261 or consent of instructor.

572 *American Constitutional History to 1865.* (3)
A study of the origins and development of American constitutional institutions from 1603 to 1865, with emphasis on political, economic and social influences.

573 *American Constitutional History Since 1865.* (3)
A continuation of HIS 572 from 1865 to the present, with emphasis on constitutional problems posed by the industrial revolution and the warfare state.

574 *The Diplomacy and Foreign Policy of the United States to 1919.* (3)
A survey designed to acquaint the student with the principles of American foreign policy and its historical evolution. Prereq: HIS 108 or equivalent.

575 *The Diplomacy and Foreign Policy of the United States Since 1919.* (3)
A continuation of 574. Foreign policy after the United States became a world power. Prereq: HIS 109 or equivalent.

576 *The American Frontier.* (3)
A course dealing specifically with American westward expansion. Prereq: HIS 108 and 109 or equivalent.

577 *The American Frontier.* (3)
A continuation of HIS 576. It will consider the Trans-Mississippi West.

578 *History of the Old South.* (3)
A study of the colonial beginnings and expansion of southern life, economics, and society. The growth of slavery, staple agriculture, and sectional politics will constitute the major interest. Prereq: HIS 108.

579 *History of the New South.* (3)
The evolution of southern life and society, agrarian politics, relationships with other sections, industrial growth, and new leadership.

580 *U. S. Urban History to 1865.* (3)
A study of urban America from colonial times to 1865, emphasizing origins and growth of cities and their impact upon the development of the United States.

581 *U.S. Urban History Since 1865.* (3)
A continuation of HIS 580, tracing changes and developments which have occurred since 1865.

582 *Immigration and American History, 1815 to the Present.* (3)
A study of the role of the immigrant in American history, emphasizing the impact of large scale immigration upon the receiving society and changes effected by the migration upon the new arrivals themselves, in the century after 1815, and the consequences of restriction in the decades since World War I.

584 *Economic History of Latin America Since Independence.* (3)
Course emphasizes Latin American efforts in the 19th and 20th centuries to promote economic and social development, the problems encountered, the role of foreign investments and diplomatic pressures, and more recently, the economic factors in Latin American social revolutions. Prereq: HIS 208 or 209; or approval of instructor.

587 *Twentieth Century Latin American Revolutions.* (3)
An historical and comparative approach to Latin American social revolutions that have greatly influenced political movements in other Latin American countries. Prereq: HIS 208, or 209, or PS 265 or 501 or consent of instructor.

IV. THE FAR EAST

590 *Japanese History to 1600.* (3)
A broad survey of the political, social, economic, and intellectual history of Japan from earliest times to the "unification" of Japan under Hideyoshi. Prereq: HIS 104 or equivalent, or consent of instructor.

591 *Japanese History Since 1600.* (3)
A continuation of HIS 590 from 1600 to the present. Prereq: HIS 105 or equivalent, or consent of instructor.

592 *Diplomatic History of the Far East Since 1787.* (3)
A study of the international relations between China, Japan, and Korea and their relations with the major Western Powers. Prereq: HIS 105 or consent of instructor.

593 *Far Eastern History Since World War II.* (3)
A study of the revolutionary, political, economic, and social changes occurring in China, Japan, and Korea in the aftermath of World War II. Important political and institutional developments and their relation to pre-war trends will be emphasized. Prereq: HIS 105 or consent of instructor.

COURSES IN THE 600 GROUP

These seminars emphasize method and bibliography. Two class hours and one conference hour.

600 *European Historiography.* (3)

603 *American Historiography.* (3)

606 *Historical Criticism.* (3)
Required of every entering graduate student in history.

611, 612 *Readings in Ancient History.* (3 each)
An intensive study of the bibliography of Greek and Roman History, primary (in translation) and secondary, criticism and analysis of selected books, and of recent articles in professional journals. Prereq: Consent of instructor.

613, 614 *Readings in Medieval History.* (3 each)
A course designed to provide systematic and extensive reading over broad areas of the period indicated, to acquaint the student with the standard source materials and literature of the field, and to provide opportunity for critical discussion of outstanding issues. Prereq: An undergraduate course in Medieval History.

621, 622 *Readings in European History 1500-1815.* (3 each)
Courses designed to provide systematic and extensive reading over broad areas of the period indicated, to acquaint the student with the standard source materials and literature of the field, and to provide opportunity for critical discussion of outstanding issues. Prereq: An undergraduate course in European History.

623, 624 *Readings in European History Since 1815.* (3 each)
Courses designed to provide systematic and extensive reading over broad areas of the period indicated, to acquaint the student with the standard source materials and literature of the field, and to provide opportunity for critical discussion of outstanding issues. Prereq: An undergraduate course in European History.

625, 626 *Readings in British and British Empire History.* (3 each)
An intensive study of the bibliography of British and British Empire History, primary and secondary, with readings, analyses and criticisms of selected titles in the literature of the field and of recent published research in the professional journals. Prereq: An undergraduate course in British History.

631, 632 *Readings in United States History to 1865.* (3 each)
Courses designed to provide systematic and extensive reading over broad areas of American History in the period indicated, to acquaint students with source materials and the secondary literature of the field, and to provide opportunity for critical discussion of books and issues. Prereq: An undergraduate course in American History.

633, 634 *Readings in United States History Since 1865.* (3 each)
Courses designed to provide systematic and extensive reading over broad areas of American History in the period indicated, to acquaint students with source materials and the secondary literature of the field, and to provide opportunity for critical discussion of books and issues. Prereq: An undergraduate course in American History.

635 *Readings in Modern Russian History.* (3)
A guided program (with readings primarily in translation) designed to familiarize the student with the broad patterns and specific developments of the modern imperial period (beginning with Peter I), to analyze the position of Russia in international affairs, and to assess the causes and nature of the 20th century revolutions. Prereq: Consent of instructor.

636 *Readings in Modern Russian History.* (3)
A program relying considerably upon readings (mostly in translation) which will offer the student a broad comprehension of the nature of the Soviet system and of the blocs of other Marxist states by focusing upon the ideological foundations, evolutionary patterns and specific developments that comprise the history of the Soviet Union from 1917 to the present. Prereq: Consent of instructor.

637, 638 *Readings in Latin American History.* (3 each)
Supervised reading at the graduate level of a select topical bibliography covering the main themes of colonial Latin American history or the modern period. Prereq: HIS 208 and 209 or consent of instructor.

639 *Readings in Far Eastern History.* (3)
Supervised reading at the graduate level of a select topical bibliography covering the main themes of Chinese history during the Ch'ing Dynasty (1644-1912) and Japanese history during the Tokugawa period (1615-1867). Prereq: HIS 295 and 296 or consent of instructor.

640 *Readings in Far Eastern History* (3)
Supervised reading at the graduate level of a select topical bibliography covering the main themes of Chinese history since 1895 and Japanese history since 1868. Prereq: HIS 295 and 296 or consent of instructor.

695 *Independent Work.* (1-3)
Under special conditions selected students may investigate problems with weekly reports to the instructor. Prereq: Consent of instructor. May be repeated for a maximum of 9 credits.

COURSES IN THE 700 GROUP

Seminars—basically research in character. These are not content courses. They provide special training in historical research (collection and critical analysis of bibliography, note-taking and organization of materials, and the presentation of a properly documented research paper). Topics will be chosen in keeping with the interests of the professors in charge. Two class hours and one conference hour.

700 *Special Problems in History.* (3)
Visiting professors will conduct research seminars in topics or problems in which they have special research interests. Prereq: At least one year of graduate study in history.

705 *Seminar in Ancient History.* (3)
Select topics in Greek and Roman history, with an intensive study of a particular area or aspect of the ancient world. Prereq: reading knowledge of at least one ancient language and one modern foreign language, or consent of instructor.

706 *Seminar in Medieval History.* (3)
Directed research on a common problem. Prereq: Latin and one modern European language.

710 *Seminar in American History, 1607-1783.* (3)
May be repeated once for a total of six credits.

711 *Seminar in American History, 1783-1865.* (3)
May be repeated once for a total of six credits.

712 *Seminar in American History, 1865 to the Present.* (3)
May be repeated once for a total of six credits.

715 *Seminar in Latin American History.* (3)
This seminar course will consider special problems encountered in the study of Latin American History. Prereq: HIS 208, 209, 584 or consent of instructor.

720 *Seminar in Modern European History, 1500-1714.* (3)
May be repeated once for a total of six credits.

721 *Seminar in Modern European History, 1714-1870.* (3)
May be repeated once for a total of six credits.

722 *Seminar in Modern European History, 1870 to Present* (3)
May be repeated once for a total of six credits.

730 *Seminar in Modern British History.* (3)

740 *Seminar in Kentucky History.* (3)
The development of Kentucky as a Western commonwealth, with emphasis on economic and political phases from the 18th century to the present, with writing of papers based upon research among documents and other source materials.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
Topic will be chosen in keeping with interest of professors in charge. May be repeated once.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely.

MATHEMATICS

The Department of Mathematics grants the M.A., M.S. and Ph.D. degrees. There are no specific course prerequisites for admission; however, two semesters of advanced calculus, and at least one semester each of algebra and topology are suggested.

The master's degree is offered under both Plans A and B. A graduate student who holds a teaching assistantship is expected to complete the M.A. or M.S. program within two years.

The doctorate is a research degree granted on the basis of broad mathematical knowledge and exhibited creative ability. Course work leading to the doctorate is available in the fields of algebra, analysis (classical and modern), applied mathematics, differential equations and topology. A comprehensive examination is required of each student. This examination normally is given after two years of graduate study.

In order to be admitted to candidacy for the degree, a student must pass proficiency examinations in two foreign languages chosen from French, German or Russian, complete studies in a minor field (either inside or outside the department) and successfully complete the comprehensive examinations. Subsequent work becomes highly specialized through seminars, independent study, and finally, work on a dissertation which penetrates in depth some field of particular interest. Areas in which members of the faculty have active research projects include functional analysis, algebraic and point-set topology, group theory, ring theory, complex analysis, Fourier analysis, rational approximation, function algebras and differential equations.

421 *Elementary Numerical Methods.* (3)

Outline of capabilities and limitations of the computer. Number representation. Propagation of errors through basic arithmetical operations. Applications of analysis to error-estimation. Linear and non-linear equation solving. Matrix eigenvalues. (This course could serve as an introduction both for the specialist and the non-specialist). Prereq: MA 214 or equivalent.

423 *Introductory Probability.* (3)

Set theory; fundamental concepts of probability, including conditional and marginal probability; random variables and probability distributions (discrete and continuous); expected values and moments; moment-generating and characteristic functions; random experiments; distributions of random variables and functions of random variables; limit theorems. Prereq: MA 214. (Same as STA 423.)

432 *Methods of Applied Mathematics I.* (3)

Partial differentiation, Jacobians, implicit function theorem, uniform convergence of series, line and surface integrals, Green's and Stokes' theorems. Prereq: MA 214 or equivalent.

433 *Methods of Applied Mathematics II.* (3)
Elementary complex variable theory with applications. Complex field, analytic functions, Cauchy theorem, power series, residue theory. Prereq: MA 432 or MA 471.

441 *Geometry I.* (3)
Euclidean, affine, projective spaces, and the classical groups. Prereq: MA 362 or equivalent.

442 *Geometry II.* (3)
Selected topics chosen from among hyperbolic geometrics, spherical and elliptical geometrics, differential geometry, geometric inequalities, circular transformations, manifolds and differential manifolds. Prereq: MA 441 or consent of instructor.

462 *Matrix Analysis.* (3)
Vectors, matrices, vector-valued and matrix-valued functions, differentiation, integration, Jacobians, Wronskians, inversion of matrices, eigenvalues, matrices of special forms, inner product spaces and tensors. (This course is a prerequisite for 500-level courses in Differential Equations.) Prereq: MA 214 or equivalent.

471 *Advanced Calculus I.* (3)
The first half of a year sequence which will cover the standard topics of uniformity, integrals, and derivatives in n-space, Stokes' theorem and selected other topics. Prereq: MA 214 and 351 or equivalent.

472 *Advanced Calculus II.* (3)
A continuation of MA 471. Prereq: MA 471 or consent of instructor.

481 *Differential Equations.* (3)
Brief review of linear differential equations and matrix algebra, eigenvalues and eigenvectors of matrices, systems of linear differential equations with constant coefficients, applications, Sturm separation and comparison theorems, Sturm-Liouville theory for second-order equations and applications. Prereq: MA 214 or equivalent.

485 *Fourier Series and Boundary Value Problems.* (3)
This is an introductory treatment of Fourier series and its application to the solution of boundary value problems in the partial differential equations of physics and engineering. Orthogonal sets of functions, Fourier series and integrals, solution of boundary value problems, theory and application of Bessel functions and Legendre polynomials. (Same as EM 585.) Prereq: MA 432 or equivalent.

501, 502 *Seminar in Selected Topics.* (3)
Various topics from the basic graduate courses. Designed as a course for teachers of lower division mathematics and usually offered in connection with a summer institute. Prereq: Teaching experience in field of mathematics and consent of instructor. May be repeated once.

524 *Discrete Probability.* (3)
Sample space, combinatorial methods, combination of events, laws of large numbers, normal approximation to the binomial, generating functions, convolutions, random walks, branching processes, recurrent events. Prereq: MA 432 or 471 or consent of instructor. (Same as STA 524.)

531 *Theory of Statistical Inference I.* (4)
Sample space, concept of probability, conditional probability, random variables, density and distribution functions; mathematical expectation; moment generating functions; functions of random variables; limit laws, useful distributions, certain derived distributions, introduction to estimation and hypothesis testing. Prereq: MA 432 or 471 or consent of instructor. (Same as STA 531.)

532 *Ordinary Differential Equations.* (3)
Successive approximations and elementary existence theorems for scalar and vector equations, qualitative behavior of solutions as functions of initial conditions and parameters, linear systems with constant and periodic coefficients, stability theorems for second order linear and nearly linear equations, second order boundary value problems and regular singular point theory. Prereq: MA 462 and either MA 432 or MA 471.

533 *Partial Differential Equations.* (3)
Elementary existence theorems, equations of first order, classification of linear second order equations, the Cauchy and Dirichlet problems, potential theory, the heat and wave equations, Green's and Riemann functions, separation of variables, systems of equations. Prereq: MA 532 and MA 472 or equivalent.

535 *Vector and Tensor Analysis.* (3)
The algebra and calculus of vectors, cartesian tensors, curvilinear coordinates, Christoffel symbols, determinants, exterior forms, integration. Prereq: MA 214.

536 *Operational Calculus and Generalized Functions.* (3)
Testing functions; differentiation and integration of distributions or generalized functions; convolutions; Fourier and Laplace transforms; applications to linear differential equations. Prereq: MA 432 or 481.

538 *Elementary Numerical Analysis.* (3)
Interpolation. Gaussian quadrature, orthogonal polynomials. Richardson process. Numerical treatment of ordinary differential equations and intermediate linear algebra. Linear difference equations. Prereq: MA 421.

551 *Topology I.* (3)
General topology, separation exioms, normal spaces, connectedness and compactness. Prereq: Consent of instructor.

561 *Modern Algebra I.* (3)
Algebraic structures, quotient structures, substructures, product structures, groups, permutation groups, groups with operators, and the Jordan-Hölder theorem. Prereq: Consent of instructor.

565 *Linear Algebra.* (3)
Fields, vector spaces, rings of linear transformations, matrices associated with linear transformations, dual spaces, eigenvectors, canonical forms, adjoint matrices, and tensor products. Prereq: MA 214 or equivalent.

566 *Theory of Numbers.* (3)
Divisibility, prime numbers, congruences and residues, Diophantine equations. Prereq: consent of instructor.

570 *Multivariate Calculus.* (3)
A self-contained course in n-dimensional analysis, including the general form of Stokes' theorem. Prereq: MA 432 or equivalent.

571 *Analysis I.* (3)
This course is designed for advanced undergraduates and beginning graduate students. Topics include metric spaces, metric space topology, continuous functions on metric spaces, Ascoli's theorem, Stone-Weierstrass theorem and Riemann-Stieltjes integration. Prereq: MA 471 or equivalent.

572 *Analysis II.* (3)
Lebesgue measure in E^n, Lebesgue integration, product measure, Fubini theorem. Applications to L spaces and Fourier series. Prereq: MA 571 or consent of instructor.

573 *Applied Complex Analysis.* (3)
Boundary value problems, analytic continuation, contour integration, special functions. Prereq: MA 433.

611 *Independent Work in Mathematics.* (3-9)
Reading course for graduate students in mathematics. Prereq: Major in mathematics, a standing of at least 3.0 and consent of instructor. May be repeated to a maximum of 9 credits.

624 *Advanced Probability I.* (3)
Markov chains, birth and death processes, renewal theory, central limit theorem, stochastic processes. (Same as STA 624.) Prereq: MA/STA 524 or 531. Coreq: MA 433.

632 *Advanced Differential Equations.* (3)
General existence and uniqueness theorems, linear systems, regular and singular eigenvalue problems, stability theory, nonlinear oscillation theory, asymptotic theory, equations with retarded argument. Prereq: MA 532 or consent of instructor.

635 *Theory of Tensors.* (3)
Graded tensor algebra of a module over a ring, groups as modules over the integers, vector spaces over fields and the module of vector field germs, vector fields on open sets in vector spaces and on manifolds, graded exterior algebras, and integration of forms. Prereq: MA 561 or consent of instructor.

637 *Approximation Theory.* (3)
Approximation problems in linear normed spaces; Weierstrass theorem and extensions; Muntz theorem; characterization of polynomials of best approximation; approximation in L^p spaces; interpolation processes, entire functions as approximants. Prereq: MA 433 and 571.

638 *Advanced Numerical Analysis.* (3)
Discrete approximations to the solution of boundary value problems in ordinary and partial differential equations, numerical treatment of associated systems of linear equations. Prereq: MA 538.

641, 642 *Differential Geometry.* (3 each)
Tensor products, exterior algebra, differentiable maps, manifolds, geodesics, metric properties of curves in E^n fundamental forms, surfaces. Prereq: Consent of instructor.

651 *Topology II.* (3)
Embedding and metrization, compact spaces, uniform spaces and function spaces. Prereq: MA 551.

653 *Dimension Theory.* (3)
Primarily concerned with dimensions of separable metric spaces. Will also consider the relationships between various definitions of dimensions. Prereq: MA 651.

654 *Algebraic Topology I.* (3)
Homotopy, fundamental groups, simplicial homology, axioms for homology theory. Prereq: MA 551, MA 561, 651 or equivalent.

655 *Algebraic Topology II.* (3)
Singular homology theory and applications, homology of products, singular and Cech cohomology, with applications. Prereq: MA 654.

661 *Modern Algebra II.* (3)
Rings, fields of quotients, rings of polynomials, formal power series, modules, exact sequences, groups of homomorphisms, natural isomorphisms, algebras and tensor algebras. Prereq: MA 561 or consent of instructor.

667 *Group Theory.* (3)
A study of homomorphisms for groups, finite groups, solvable groups, nilpotent groups, free groups, and abelian groups. Prereq: MA 661.

671, 672 *Functions of a Complex Variable.* (3)
Differentiation and integration, contour integration, poles and residues, Royster, Taylor and Laurent series, conformal mapping, Riemann mapping theorem, Dirichlet problem, multiple-valued functions, Riemann surfaces, and applications. Prereq: MA 571, 572.

673 *Several Complex Variables.* (3)
Hartogs' theorem, domains of holomorphy, pseudoconvexity, Cousin problems, differential forms, DeRham's theorem, cohomology of domains of holomorphy, Levi problem, sheaves, Stein manifolds. Entire functions of several variables. Prereq: MA 672.

678 *Calculus of Variations.* (3)
The ordinary problem for the plane and space; Weierstrass, the necessary conditions of Euler, Weierstrass, Legendre, and Jacobi. The parametric problem; the isoperimetric problem. Sufficiency conditions. Prereq: Consent of Instructor.

681 *Functional Analysis I.* (3)
General theory of normed linear spaces including the Hahn-Banach separation theorems, principle of uniform boundedness and closed graph theorem. Dual spaces and representation theorems for linear functionals. Abstract measure theory and Riesz representation theorem for C(X). Prereq: MA 572 or consent of instructor.

682 *Functional Analysis II.* (3)
Weak and weak-star topologies, reflexive spaces, convexity in linear spaces, operators, adjoint operators, spectral theory and Fourier transforms. Prereq: MA 681.

683 *Convergence and Summability.* (3)
Fundamental limit ideas applied to infinite sequences, infinite series, infinite products, etc. Summability of Cesaro, Holder, Abel, Borel and Leroy. Prereq: MA 571 or consent of instructor.

685 *Fourier Analysis.* (3)
Expression of a general periodic function as a Fourier series, sufficient conditions for convergence. Fejer's theorem, applications. Prereq: MA 572.

687 *Integral Equations.* (3)
Systems of ordinary linear equations, linear operators, orthogonal systems, linear integral equations of the second kind, theorems of Fredholm, Volterra's equation. Prereq: consent of instructor.

703 *Advanced Probability II.* (3)
Review of probability spaces, general stochastic processes, special analysis of stationary random processes, infinitely divisible distributions, theory or queues. Prereq: MA/STA 624. Coreq: MA 572. (Same as STA 703.)

732 *Selected Topics in Differential and Integral Equations.* (3)
Advanced topics in the theory of differential (ordinary or partial) and integral equations such as topological dynamics, almost periodic solutions, stochastic differential equations, integro-differential and differential-difference equations, generalized functions as solutions, non-linear partial differential equations, singular integral equations.

751, 752 *Selected Topics in Topology.* (3 each)
Prereq: MA 651.

753, 754 *Selected Topics in Functional Analysis.* (3 each)
Prereq: MA 682.

755, 756 *Selected Topics in Topological Algebra.* (3 each)
Topics chosen from: Lie groups, transformation groups, topological groups, semigroups, rings, semirings and lattices. Also reports on and discussion of recent advances in topological algebra. Prereq: MA 651 or consent of instructor.

757 *Seminar in Topology.* (3)
Review of current research in topology. Prereq: Consent of instructor.

761 *Homological Algebra.* (3)
Homological algebra, modules, exact sequences, functors, homological dimension, extension problems. Prereq: Consent of instructor.

762 *Theory of Rings.* (3)
This course will consist primarily of the study of ring theory. Prereq: Consent of instructor.

763 *Theory of Fields.* (3)
Separable and inseparable extensions, splitting fields, normal extensions, fundamental theorem of Galois theory, and transcendental extensions. Prereq: MA 561 and 661.

764, 765 *Selected Topics in Algebra.* (3 each)
Reports and discussion on recent advances in group theory, ring theory, and homological algebra. Prereq: MA 661 and consent of instructor.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.
Staff.

771, 772 *Selected Topics in the Theory of Complex Variables.* (3 each)
Prereq: Consent of instructor.

773, 774 *Selected Topics in Analysis.* (3 each)
May be repeated once for a total of six credits each. Prereq: Consent of instructor.

777 *Mathematical Seminar.* (3)
May be repeated once for a total of six credits.

778 *Mathematical Seminar.* (3)
May be repeated once for a total of six credits each.

MICROBIOLOGY

For description of program, see p. 73.

MUSIC

The Department of Music offers the Doctor of Musical Arts in Music Teaching, the Master of Arts, the Master of Music with a major in Applied Music, Composition, Theory, or Music Education, and the Master of Arts in Education, with emphasis in the field of Music Education. Candidates for these degrees must present the approximate equivalent of the University of Kentucky's undergraduate requirements in music appropriate to the prospective area of concentration on the master's level. Normally, a candidate should expect to spend a minimum of two semesters and one summer session or the equivalent in residence as a full-time graduate student to complete the requirements for a master's degree in music. The candidate for the Doctor of Musical Arts in Music Teaching must complete not fewer than three years of graduate work.

Graduate Record Examination scores must be presented by the end of the

first semester or first summer session the student is enrolled. Candidates failing to comply with this requirement will not be permitted to register for further course work until the Graduate Record Examination has been taken. If the results of the Graduate Record Examination or Departmental Examination reveal deficiencies in the candidate's background, additional course work may be required as determined by the Director of Graduate Studies in the Department of Music.

GENERAL REQUIREMENTS FOR MASTER'S DEGREE

Foreign Language Requirements—The undergraduate record of Master of Music candidates must show credit for one year of foreign language study. In the event it does not, the candidate will be required to study one year of a foreign language as a graduate student. This credit will not apply toward the Master of Music degree. Candidates in Applied Music-Voice must have completed one year of study in each of two modern foreign languages. The Master of Arts degree with a major in music requires a reading knowledge of one foreign language, preferably French or German.

Thesis Requirements—The Master of Arts degree requires a thesis. A public recital acceptable to the faculty is required in lieu of a thesis for the Master of Music degree in Applied Music. A composition of major proportions, acceptable to the faculty and publicly performed, must be submitted in lieu of a thesis by candidates for the Master of Music degree in Composition. A thesis is optional in the Master of Music in Music Education or Theory and Master of Arts in Education curricula.

Twenty-four hours of work are required with a thesis or 30 hours without.

A final comprehensive examination is required for each program.

MASTER OF ARTS (MUSIC)

Prerequisites: A suitable background in music theory or music literature and satisfaction of the Graduate School requirement for a reading knowledge of one foreign language, normally French or German.

Music History and Literature	6 hours
Theory	4 hours
Research Methods (Music 682)	2 hours
Minor (outside Department of Music)	3 hours
Directed electives	9 hours
Thesis	0 hours
	24 hours

MASTER OF MUSIC (THEORY)

Prerequisite: 10 hours of upper division theory, including form and analysis and counterpoint, or the equivalent.

Theory	10 hours
Research Methods (Music 682)	2 hours
Music History and Literature	6 hours
Directed electives	6 hours
	24 hours

The student may either prepare a thesis or take six additional hours of Theory, Composition, or Music History and Literature courses for a total of 30 hours of course work.

MASTER OF MUSIC (COMPOSITION)

Prerequisite: Submission of three original compositions.

Advanced Composition (Music 673)	4 hours
Music History and Literature	6 hours
Theory	8 hours
Directed electives	6 hours
Thesis composition	0 hours
	24 hours

The thesis composition must be publicly performed and the student is responsible for the preparation of legible score and parts.

MASTER OF MUSIC (APPLIED MUSIC)

Prerequisite: Acceptance by the appropriate faculty of applied music.

Applied Music (including recital)	9 hours
Music History and Literature	6 hours
Theory	4 hours
Directed electives	11 hours
Recital	0 hours
	30 hours

Wind, string and percussion majors must participate in at least one University-sponsored performing organization for two semesters unless excused by a vote of the faculty.

MASTER OF MUSIC (MUSIC EDUCATION)

PLAN I

History and Philosophy of Music Education (Music 744)	3 hours
Supervision and Administration of School Music (Music 742)	3 hours

Music Education Electives	6 hours
Applied Music (500 level)	3 hours
Research Methods (Music 682)	2 hours
Theory	4 hours
Music History and Literature	6 hours
Electives	3 hours
	30 hours

PLAN II

History and Philosophy of Music Education (Music 744)	3 hours
Supervision and Administration of School Music (Music 742)	3 hours
Music Education—Electives	6 hours
Applied Music (500 level)	6 hours
Major—3 hours	
Electives—3 hours	
Research Methods (Music 682)	2 hours
Music History and Theory	6 hours
Electives in Music or Education	4 hours
	30 hours

PLAN III

History and Philosophy of Music Education (Music 744)	3 hours
Supervision and Administration of School Music (Music 742)	3 hours
Music Education Electives	3 hours
Applied Music	3 hours
Research Methods (Music 682)	2 hours
Music History and Theory	6 hours
Electives	4 hours
Thesis	0 hours
	24 hours

Each full-time resident graduate student in music education must participate in a University-sponsored performing organization for two semesters unless excused by a vote of the faculty.

MASTER OF ARTS (EDUCATION) (See pages 197-203)

THE DEGREE OF DOCTOR OF MUSICAL ARTS

The degree of Doctor of Musical Arts is offered in the field of Music Teaching. This degree is intended for either the college teacher of music or for the administrator or teacher of music on the pre-college level.

The requirements for this degree are the same as for the degree of Doctor of Philosophy, pp. 24-29, except that only one foreign language, normally French or German, is required for the D.M.A. degree. The candidate must also demonstrate a working knowledge of music terms in French, German, and Italian prior to the qualifying examination.

The applicant for this degree must have at least two years of successful teaching experience.

He must submit, prior to admission to candidacy, his master's thesis or two papers of approximately 1,000 words each, one of the papers dealing with the teaching of music.

Not later than the first term of study the applicant must take placement examinations in music theory, music history and literature, keyboard proficiency, performance or conducting, and in the field of proposed concentration.

The following minimum core requirements for the D.M.A. beyond the Bachelor's degree are as follows:

Music History and Literature	12 hours
Music Theory	8 hours
Research Methods 682-683	4 hours
Minor outside department	9 hours
Courses in area of specialization	at least 15 hours

The candidate will minor in either musicology or music theory, with a second minor to be taken outside the Department of Music, subject to the approval of his committee and the chairman of the department concerned.

MUSIC PERFORMANCE COURSES

Graduate courses in Music Performance carry credit hours as follows:

Series I, 1 credit hour each semester
Series II, 2 credit hours each semester
Series III, 3 credit hours each semester

All music performance courses may be repeated 3 times for credit.

All music performance courses carry 1 credit hour if taken in the Summer Session.

	Series I Secondary Courses	Series II Major Courses	Series III Major Courses
Piano	501,601	521,621	541,641
Voice	502,602	522,622	542,642
Organ	503,603	523,623	543,643
Violin	504,604	524,624	544,644
Viola	505,605	525,625	545,645
Cello	506,606	526,626	546,646

String Bass	507,607	527,627	547,647
Flute	508,608	528,628	548,648
Oboe	509,609	529,629	549,649
Clarinet	510,610	530,630	550,650
Bassoon	511,611	531,631	551,651
Trumpet	512,612	532,632	552,652
French Horn	513,613	533,633	553,653
Trombone	514,614	534,634	554,654
Baritone	515,615	535,635	555,655
Tuba	516,616	536,635	556,656
Saxophone	517,617	537,637	557,657
Percussion	517,618	538,638	558,658
Harp	519,619	539,639	559,659
Harpsichord	520,620	540,640	560,660
Gamba	561,661	571,671	581,681
Historical Instruments	562,662	572,672	582,682

MUSIC COURSES

560 *Supervision of Music.* (1) II, S

A study of supervision of the school music program through curriculum planning, supervisory techniques, administrative and community relationships, the use of mechanical aids in the improvement of teaching, etc. Prereq: MUS 360 or 362, 363. *Staff.*

561 *Music Activities in the Elementary School.* (2) I, II, S

The study of music and its contribution to child development. An analysis of instructional materials and the development of criteria for the evaluation of these materials. Advanced studies and activities in rhythms, singing, listening, creativity, and reading music to create a musical environment in the classroom. Open to classroom teachers only. Prereq: MUS 260, 261 or equivalent; consent of the instructor. *Staff.*

562 *Conducting.* (2) I

A study of the technique and practice of the fundamentals of conducting. Two meetings a week. *Miller.*

563 *Conducting.* (2) II

A continuation of 562. Two meetings a week. Prereq: MUS 562. *Miller.*

564 *Interpretation of Choral Music.* (2) I, II, S

A study of the fundamentals of choral conducting and choral literature, emphasizing materials for the secondary school level. *Kiviniemi.*

565 *Vocal Pedagogy.* (2) I, S

For teachers of voice, supervisors of music and choir directors. The study of physical and psychological problems in the teaching of voice production, the study of breath control, diction, resonance, interpretation and repertoire. *Ivey, Graham.*

568 *General Music in the Secondary School.* (2) I, II, S

Techniques and materials for general music activities in the junior and senior high schools, emphasizing the teaching of music as a humanistic discipline. *Staff.*

570 *Orchestration.* (2) I, S

This course includes a study of the individual instruments of the orchestra and band with practice in scoring for these instruments. Two meetings a week. Prereq: MUS 371. *Staff.*

571 *Orchestration.* (2) II, S
A continuation of MUS 570. Two meetings a week. Prereq: MUS 570.

572 *Counterpoint.* (2) I, S
A study of Counterpoint based on 16th Century and 18th Century contrapuntal techniques, original composition and analysis. *Wright.*

573 *Counterpoint.* (2) II, S
A continuation of MUS 572. Prereq: MUS 572. *Wright.*

574 *Composition.* (2) I, S
A basic course in original composition and orchestration. Prereq: MUS 371. *Wright, Chance.*

575 *Composition.* (2) II, S
A continuation of MUS 574. Prereq: MUS 574. *Wright, Chance.*

577 *Acoustics of Music.* (3) I, S
A study of the musical applications of sound phenomena. Prereq: Completion of 14 hours of music theory. *Kiviniemi.*

579 *Baroque Music.* (3) I, S
The history of vocal and instrumental music in the Baroque style from 1600 to 1750. Prereq: MUS 280, 281, or MUS 200 and permission of instructor. *Staff.*

580 *Music in the Eighteenth Century.* (3) I, II, S
The development of music in the Classic style from the early 18th century to 1880. Prereq: MUS 280, 281, or MUS 200 and permission of instructor. *Longyear.*

581 *Nineteenth Century Music.* (3) I, II, S
A study of masterworks of music composed in the nineteenth century. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Longyear.*

582 *Piano Literature.* (3) I, S
A historical and analytical study of music written for the piano. Matters such as the emergence of the piano idiom and the development of the instrument will also be considered. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Bonn.*

583 *Symphonic Literature.* (3) I, S
An intensive study of orchestral literature. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Longyear.*

584 *Music for the Solo Voice.* (3) I, S
A stylistic study of solo vocal music from the Troubadours to the present. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Graham, Ivey.*

585 *History and Literature of the Organ.* (2) I, S
A course of study designed to give the organ student a practical knowledge of the development of the organ, its construction, the standard literature, and teaching materials. Two meetings a week. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Blackburn.*

586 *History and Literature of the Organ.* (2) II, S
A continuation of MUS 585. Prereq: MUS 585. *Blackburn.*

587 *Twentieth Century Music.* (3) II, S
A stylistic study of representative compositions of the twentieth century. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Kinney, Wright.*

588 *History and Literature of Opera.* (3) I, S
The development of opera as an art form, and analysis of representative operas from various eras. Prereq: MUS 280; 281; MUS 200 and permission of instructor. *Longyear.*

589 *History of American Music.* (3) II, S
A study of music in America from colonial times to the present. Prereq: MUS 280, 281; or MUS 200 and permission of instructor. *Henderson.*

590 *Opera Theater.* (1) I, II, S
May be repeated to a maximum of three credits. Prereq: Permission of instructor. *Graham.*

591 *Music Education Workshop.* (1) S
Intensive study of advanced methods and materials in one of the following areas of music education: elementary and general music, the school orchestra, the school band, choral music. May be repeated for a total of two credits. *Staff.*

592 *Music Education Workshop.* (2) S
Intensive study of advanced methods and materials in one of the following areas of music education: elementary and general music, the school orchestra, the school band, choral music. May be repeated for a total of four credits. *Staff.*

598 *Chamber Music Ensembles.* (1) I, II, S
The study of chamber music through performance. Two lab hours per week. May be repeated once for a total of two credits. Prereq: Permission of instructor. *Staff.*

599 *Collegium Musicum.* (3) I, II, S
The study and realization of performance practices in early music. May be repeated once for credit. *Staff.*

620 *Advanced German Vocal Repertory.* (3)
An intensive study of the German vocal repertory from the standpoint of interpretive problems, diction, and vocal elements. This course is designed primarily for singers, vocal teachers, and coaches. Prereq: Graduate standing and undergraduate voice background in German diction and German Lieder repertory.

621 *Advanced French Vocal Repertory.* (3)
An intensive study of the French vocal repertory from the standpoint of interpretive problems, diction, and vocal factors. This course is designed primarily for singers, vocal teachers, and coaches. Prereq: Graduate standing. Undergraduate preparation in an undergraduate voice major background in French vocal repertory.

660 *Advanced Instrumental Conducting.* (2) II, S
This course is intended to develop further the ability to interpret and conduct the larger forms written for the symphony orchestra and concert band. Prereq: MUS 562, 564. *Miller.*

661 *Advanced Choral Conducting.* (2) I, S
The art of choral conducting as applied to various styles and forms of music. Study of unaccompanied works, works with small instrumental combinations, and works for chorus and orchestra. Prereq: MUS 563. *Kiviniemi.*

662 *Advanced Band Techniques.* (2) II, S
An advanced course in band techniques with concentration on band organization and materials, the technique of band conducting, and intensive study in the field of band arranging. *Staff.*

663 *Advanced Instrumental Techniques.* (2) II, S
An advanced technical study of playing string, brass and woodwind instruments, designed for the needs of school music teachers. May be repeated once for credit. *Staff.*

667 *Current Practices in Elementary School Music.* (2) I, II, S
Contemporary philosophies and objectives of music in the elementary school. The in-service training of the classroom teacher; the music specialist as a resource person. Techniques for developing the child's musical interest and capacity for music. The status of music in America's public schools. Open to music teachers only. Prereq: MUS 360 or its equivalent. *Nash.*

668 *Introduction to Ethnomusicology* (3) II, S
Studies in the folk and tribal music of all cultures and in the functional and art music of the non-Western world. Brief consideration will also be given to specific problems and techniques of the ethnomusicologist. *Staff.*

669 *Analytical Techniques.* (2) I, S
Studies in the analysis of stylistic practices in the music of the 18th and 19th centuries. Prereq: MUS 271 and 273 or equivalent. *Kinney.*

670 *Theory Review.* (0) I, S
A review of the fundamentals of music theory. *Wright.*

671 *Advanced Musical Analysis.* (3) I, S
A course designed to show the changing aspects of musical style through analysis of representative compositions from all periods. Prereq: At least 8 hours of upper division theory or consent of instructor. *Kinney, Wright.*

672 *Advanced Musical Analysis.* (3) II, S
A continuation of MUS 671. Prereq: MUS 671. *Kinney, Wright.*

673 *Advanced Composition.* (2) I, II, S
May be repeated to a maximum of six credits. Prereq: MUS 574 and 575. *Wright.*

674 *Pedagogy of Theory.* (2) I, II, S
The teaching of music theory. *Fitzgerald.*

675 *Pedagogy of Theory.* (2) I, II, S
The teaching of music theory. A continuation of MUS 674. *Fitzgerald.*

676 *Sixteenth Century Counterpoint.* (2)
The study of sixteenth century contrapuntal techniques through analysis and composition. (Offered according to demand.) *Wright.*

680 *Medieval Music.* (3) I
The development of Western music through the fourteenth century. *Staff.*

682 *Research Methods.* (2) I, S
A course designed to acquaint the student with the basic research techniques and materials in music. *Longyear.*

683 *Advanced Research Methods.* (2) II, S
A continuation of MUS 682. For doctoral students. Prereq: MUS 682. *Longyear.*

684 *Renaissance Music.* (3) II
A survey of vocal and instrumental music of the 15th and 16th centuries. *Staff.*

685 *Choral Music.* (3) I, S
The history and literature of vocal ensemble and choral music from 1500 to the present. *Kiviniemi.*

686 *History of Chamber Music.* (3) I, S
An intensive study of the development of instrumental chamber music. *Kinney, Longyear.*

687 *History of Performance Practices.* (3) I, II, S
A survey of practices in the performing of European music from the later Middle Ages to 1800, based on evidence from contemporary sources. Must be taken concurrently with MUS 599. *Staff.*

742 *Administration and Supervision of Public School Music.* (3) II, S
A study of current trends in school music, curricula, testing programs, and other supervisory procedures. (Same as EDC 742.) *Nash.*

744 *History and Philosophy of Music Education.* (3) I, S
A historical survey of thought concerning the place and significance of music in the education of the individual and the group. (Same as EDC 744.) *Staff.*

760 *Psychology of Music.* (3) II, S
A study of the processes of music thinking and the effects of music on human behavior. *Staff.*

761 *Seminar in Music Education.* (3) I, II, S
Advanced professional study in the theory and practice of music education. May be repeated once for a total of 6 credits. Prereq: Permission of instructor. *Staff.*

762 *Music in Higher Education.* (3) II, S
Historical and comparative studies in the teaching and administration of music in colleges and universities. Includes case studies in administration, music in European higher education and the relationship of music to all other elements of the academic program. Prereq: MUS 744. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

771 *Contemporary Musical Idioms.* (3) II, S
An intensive study of compositional procedures in music since 1920. Prereq: MUS 587 (may be taken concurrently with the consent of instructor). *Wright.*

775 *Medieval Notation.* (3) I
The study and transcription of the notation of Medieval music from the earliest plainchant sources to mannered notation of the late Ars Nova in Italy and France. Prereq: MUS 680 (may be taken concurrently) and consent of instructor. Three class hours and one lab hour per week. *Staff.*

776 *Renaissance Notation.* (3) II, S
The study and transcription of the notation of Renaissance polyphony from the time of the Burgundian school through Palestrina and contemporaries, and of the various keyboard and lute tablatures of the 16th and 17th centuries. Three class hours and one lab hour per week. Prereq: MUS 684 (may be taken concurrently) and consent of instructor. *Traficante.*

777 *Seminar in Musicology.* (3) I, II, S
Study and research in specific musicological problems. May be repeated twice for credit. Prereq: Four graduate level courses in musicology. *Staff.*

779 *Studies in Music History.* (2) I, II, S
Intensive studies of a musical genre, a composer, or a school of composers. May be repeated once for credit. *Staff.*

780 *Independent Work in Music Education.* (1) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

781 *Independent Work in Music Education.* (2) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

782 *Independent Work in Music Education.* (3) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

783 *Independent Work in Music Theory.* (1) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

784 *Independent Work in Music Theory.* (2) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

785 *Independent Work in Music Theory.* (3) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

786 *Independent Work in Musicology.* (1) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

787 *Independent Work in Musicology.* (2) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

788 *Independent Work in Musicology.* (3) I, II, S
Prereq: 4-6 hours of graduate credit in the area of specialization. *Staff.*

PHILOSOPHY

The Department of Philosophy offers courses of study leading to a Master of Arts degree under Plan A. The department admits those students who wish to further their philosophical interests with work at the M.A. level and those students who view the program as preparatory to pursuit of the Ph.D. (At present the department does not offer this degree). The department does not require an undergraduate major in philosophy as a prerequisite to the graduate program; however, remedy for deficient background in history of philosophy and logic must be undertaken upon entrance to the program.

500 *History of Ancient Philosophy.* (3) I
A survey of the philosophical thought of ancient Greece and Rome, up to the rise of Christendom.

502 *Plota and Aristotle.* (3)
Plato's life and writings. Principal topics in major dialogues (e.g. the Forms or Ideas, body and soul, immortality, the good life, cosmology and theology, and logical explorations). Selected passages in Aristotle's major works. Prereq: One course in philosophy or consent of instructor.

505 *History of Medieval and Renaissance Philosophy.* (3)
Investigation of the major views in philosophy from Plotinus to Descartes. Neo-platonic and Aristotelian contributions to logic, metaphysics and the theory of knowledge will be examined critically in relation to modern and contemporary issues in philosophy.

510 *History of Modern Philosophy.* (3) II
A survey of modern philosophy from the seventeenth to the middle of the nineteenth century.

512 *American Philosophy.* (3)
A critical survey of American philosophical movements, notably idealism, pragmatism, realism, naturalism, logical positivism, and phenomenology. Three class hours per week. Offered in alternate years.

512 *American Philosophy.* (3)
A study of philosophical developments in the 20th Century, with concentration on the analytic movements (logical atonism, logical positivism, and linguistic analysis).

516 *Phenomenology.* (3)
An account of the phenomenological movement from Husserl to the present, with emphasis on the development of a phenomenological method including elements such as Intentionality, Reduction, Constitution and their relations to the Structure of Appearance. Three class hours per week. Offered in alternate years. Prereq: PHI 510. *Staff.*

518 *Existentialism.* (3)
A systematic study of the fundamental concepts and problems of existentialism. Selected readings in Kierkegaard, Nietzsche, Sartre, Marcel, Heidegger and Jaspers.

520 *Intermediate Logic.* (3)
An intermediate course in logic which reviews the logic of propositions, develops the logic of quantification and introduces metalogical issues in the construction, consistency and completeness of deductive systems. Prereq: PHI 220 or consent of instructor.

530 *Contemporary Ethics.* (3)
A study of the major developments in the field of ethics, notably intuitionism, naturalism, emotivism, and the analysis of the logic and the language of moral statements. Prereq: PHI 230 or consent of instructor.

535 *Social and Political Philosophy.* (3)
A critical examination of some philosophical problems concerning the nature and evaluation of social and political organizations. For example, questions concerning the nature, justification, and limits of political power may be explored in connection with a study of important classical positions.

540 *Great Religions.* (3) I, S
A descriptive survey of several religions as they developed within their culture, for example: Hinduism, Buddhism, Confucianism, Judaism, Christianity.

545 *Philosophy of Religion.* (3)
An analysis of the philosophical issues raised by religion, such as the problem of religious knowledge, the nature of religious languages, science and religion, concepts of God, death, and evil.

550 *Metaphysics.* (3)
Examination of efforts by philosophers to construct general conceptions of the world. Recent approaches to philosophy and metaphysical investigation. Prereq: Two courses in philosophy or consent of instructor.

555 *Epistemology.* (3)
A study of the origins, nature, kinds and validity of knowledge, with accent both on traditional epistemological problems and on analyses of epistemological concepts.

560 *Philosophy of Science.* (3) II
An examination of the logical and epistemological foundations of empirical science, including such topics as the unity and diversity of the sciences, methodology, theory and explanation, and current studies in the language of science. Prereq: PHI 220.

565 *Philosophy of Language.* (3) I
An investigation of problems current in the philosophy of language such as meaning and reference, the nature of analysis, linguistic relativity, and the relation of linguistics to philosophy.

570 *Philosophy of History.* (3)
A critical survey of philosophies of history including representative readings from the works of philosophers such as Hegel, Marx, Spengler, Niebuhr and Ortega y Gasset. Critical attention will be directed to the problem of "explanation" in history.

575 *Philosophy of Mind.* (3)
An examination of problems current in the philosophy of mind, such as the concept of person, the relation of mind and body, the relation of minds and machines, knowledge of other minds, and the roles of dispositions and volitions in human action. Attention will be given to the philosophical analysis of such psychological categories as consciousness, feeling, emotion, perception, imagination, thinking and will.

592 *Aesthetics.* (3)
Problems of method in aesthetics; major types of aesthetic theory. Aesthetic materials of the arts in literature, music, and the space arts. Form and types of form. Meaning in the arts. Interrelations of the arts. Lectures, discussions, reports. (Same as A-H 592.)

620 *Types of Logical Theory.* (3)
An intensive study of recent and contemporary contributions to logical theory: Whitehead and Russell, C. I. Lewis, R. Carnap, John Dewey, and others. May be repeated to a maximum of six credits. Three class hours per week. *Staff.*

625 *Advanced Logic.* (3)
Intensive study of selected topics arising from propositional as well as lower and higher order predicate logic, e.g. Modal Logic, Many-Valued Logic, Quantification Theory, Class Logic and Paradoxes. The course will stress the diversity of approaches to these issues within formal logic. Prereq: PHI 520 or consent of instructor.

700 *Seminar in Ancient Philosophy.* (3)
Intensive study of original works of such major classical philosophers as Plato and Aristotle. May be repeated for a total of 9 hours. Prereq: PHI 500 or equivalent. *Staff.*

710 *Seminar in Modern Philosophy.* (3)
Intensive study in the major works of such prominent philosophers of modern times as Descartes, Locke, Hume, Kant, and Hegel. May be repeated for a total of 9 hours Prereq: PHI 510 or equivalent. *Staff.*

715 *Seminar in Contemporary Philosophy.* (3)
Intensive study of current developments in philosophy as found in books and periodicals. May be repeated for a total of 9 credits. Prereq: PHI 515 or its equivalent. *Staff.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

790 *Research in Philosophy.* (3)
This course is primarily intended for advanced students who desire and are prepared to do research in philosophy. May be repeated to a maximum of twelve credits. *Staff.*

PHYSICS AND ASTRONOMY

The Department of Physics and Astronomy offers courses and research options leading to the Ph.D. degree in the special areas of theoretical astrophysics, experimental and theoretical atomic and molecular physics, experimental and theoretical nuclear physics, experimental and theoretical solid-state physics, and many body theory, and leading to the M.S. degree in these areas and also in the special area of optics. Excellent laboratory facilities and library materials are available. A major experimental facility is the six-million volt Van de Graaff

accelerator. More detailed descriptions of each of these options will be sent on request.

Plan A or Plan B may be used to satisfy the requirements for the M.S. degree.

404 *Mechanics.* (3)
A lecture and problem course covering the fundamental laws of mechanics. Newton's Laws, statics and dynamics of a particle and rigid bodies, and oscillatory motion. Prereq: PHY 232, 242, MA 213, Concur. MA 214. *Brandenberger.*

416 *Electricity and Magnetism.* (3)
A lecture and problem course covering the theory of electrostatic fields, conductors, dielectrics, and steady currents. Prereq: PHY 232, 242; and MA 213. *Woodyard.*

417 *Electricity and Magnetism.* (3)
A continuation of PHY 416. A lecture and problem course covering electromagnetic induction, magnetic fields, magnetic materials, alternating currents, and electromagnetic radiation. Prereq: PHY 416. *Woodyard.*

472 *Interaction of Radiation with Matter.* (3)
Sources of radiation; penetration of charged particles, electromagnetic radiation, and neutrons through matter; excitation and ionization processes; radiation detection and spectroscopy; dosimetry of ionizing radiations. Three class hours per week. Prereq: PHY 260. *Hurst.*

504 *Advanced Mechanics.* (3)
A continuation and extension of PHY 404. Includes dynamics of a particle, rigid bodies, Lagrange's equations, constrained motions, and oscillations. Prereq: PHY 404, MA 214. *DeMarcus.*

508 *Optics.* (3)
A lecture and problem course covering the basic phenomena of optics. Topics include thick lenses, apertures, wave motion, interference, diffraction, polarization, double refraction and the theory of selected optical instruments. Prereq: PHY 232, 242; and MA 213. *Hanau.*

510 *Spectroscopy.* (3)
A lecture and problem course dealing with the production, recording, measuring, and interpretation of atomic and molecular spectra. Topics include basic principles of atomic structure, spectographs, photometry, interpretation of spectra in fields of atomic structure, and spectographic analysis. Prereq: PHY 232, 242; and MA 213. *Hanau.*

512 *Experimental Physics: Electricity and Magnetism.* (2)
An advanced laboratory course in electrical measurements. Special projects are elected by the student to explore certain physical relations through standard electrical measurements. Prereq: PHY 416. *Gossick.*

514 *Electronics.* (3)
A lecture and laboratory course on the theory and application of solid-state, and vacuum tube electronic devices. Two hours lecture and two hours laboratory. Prereq: PHY 416. *Brandenberger.*

515 *Theory of Measurements.* (3)
A lecture and problem course in the analysis of experiental data. Topics include finding an empirical equation to fit a set of data, approximations, probability distributions, errors and deviations, quantitative graphs, least square solutions. Prereq: PHY 504 and MA 213. *Hanau.*

519 *X-rays and Crystal Structure.* (3)
A lecture and problem course dealing with the production and properties of x-rays. Topics include absorption, scattering, polarization, etc.; wave length measurement; the Compton effect and related quantum phenomena. Prereq: PHY 232, 242; and MA 213. *Staff.*

522 *Heat and Thermodynamics.* (3)
A lecture and problem course stressing some of the fundamental principles of heat phenomena, the laws of thermodynamics, equations of state for ideal and real gases, continuity, derivation of thermodynamic relations. Prereq: PHY 232, 242; and MA 213. *Weil.*

524 *Solid State Physics.* (3)
Structure of solids, and the physical basis of the properties of materials; bonding, solid types, lattice energy; thermal, dielectric, and magnetic properties; electrons in metals and semi-conductors; theory of rectifiers, transistors and solid state devices. Prereq: PHY 232, 242; MA 213. *Gossick.*

530 *Experimental Physics: Spectroscopy.* (2)
An advanced laboratory course in the use and properties of various light sources, spectographs, photographic materials, and photometric methods; analysis of unknown materials by spectrographic methods. Prereq: PHY 510 or 508. *Hanau.*

535 *Experimental Physics: Atomic and Nuclear.* (2)
Measurement of e, e/m, h/e, resonance potentials, X-ray absorption, half-lives, beta-ray and gamma-ray absorption, gamma spectra, specific activity, alpha particle ranges, and radiation dosage. Prereq: PHY 260. *Weil.*

538 *Experimental Physics: Light.* (2)
An advanced laboratory course dealing with the properties of lenses, mirrors, prisms, gratings, and combinations of these elements in optical systems. The important phenomena of optics are studied experimentally by means of microscope, telescope, spectrometer, interferometer, polarimeter. Prereq: PHY 508. *Hanau.*

554 *Fundamental Atomic and Nuclear Physics.* (3)
Atomic models, electromagnetic radiation, special theory of relativity, X-rays and crystal structure, Compton effect, wave nature of matter, atomic spectra, vector model, Zeeman effect. Prereq: PHY 232, 242; MA 213. *Gabbard.*

555 *Fundamental Atomic and Nuclear Physics.* (3)
A continuation of PHY 554. Prereq: PHY 554. *McEllistrem.*

598, 599 *Introduction to Quantum Mechanics.* (3 ea.)
A lecture and problem course providing an introduction to quantum mechanics at the undergraduate level. Primary emphasis is on one-dimensional problems so that fundamental ideas can be assimilated without complications of purely mathematical nature. Basic postulates, Schrodinger's wave equation and its applications. Prereq: PHY 232, 242; MA 214. *Schrils.*

600 *Selected Topics in Advanced Physics.* (Subtitle required) (2-3)
Topics of an advanced and specialized nature such as the theory of angular momentum, topics in advanced theoretical nuclear physics, topics in advanced statistical mechanics. May be repeated twice. Prereq: Consent of instructor.

604 *Classical Mechanics.* (3)
A lecture and problem course covering the methods of Lagrange and Hamilton and their application to particles, systems of particles, and continuous media; variational principles; transformation theory. Prereq: PHY 504 or equivalent; MA 214. *DeMarcus.*

605 *Kinetic Theory of Matter.* (3)
A course of lectures covering the classical kinetic theory of gases. Topics include the theorems of Clausius, Joule, Maxwell and Boltzmann; Brownian movements, development of equations of change of state. Prereq: two 500 courses in Physics; MA 214. *DeMarcus.*

611 *Electromagnetic Theory I* (3)
A lecture and problem course treating electrostatics, boundary conditions, potential problems, energy in electric and magnetic fields, magnetic materials and Maxwell's Equations. Prereq: PHY 416; MA 214. *Knight.*

613 *Electromagnetic Theory II.* (3)
A continuation and extension of PHY 611. Includes theory of electromagnetic waves and applications to optical phenomena of reflection, refraction, polarization and absorption. Prereq: PHY 611. *Knight.*

618 *Thermodynamics.* (3)
A review of the two classical laws of thermodynamics and their dynamical and statistical mechanical support; Nernst's heat theorem; applications of classical thermodynamics to important problems, relative thermodynamics. Prereq: PHY 522; MA 214. *Staff.*

624 *Theory of the Solid State.* (3)
A lecture and problem course covering the fundamental theory of the structure and properties of complex atoms, molecules, liquids and solids. Topics include mechanical, chemical and thermal properties of matter. Prereq: PHY 714 or equivalent. *Philhours.*

629 *Nuclear Physics I.* (3)
A lecture and problem course dealing with advanced experimental nuclear physics. Topics include properties of nuclei, nuclear transformations, observational methods, radioactivity and interaction of radiation with matter. Prereq: PHY 604. *McEllistrem.*

630 *Nuclear Physics II.* (3)
A lecture and problem course concerned with the theories of the structure of atomic nuclei. Topics include nuclear shell structure, internuclear forces, nuclear binding energies, and theory of nuclear reactions. Prereq: PHY 714 or equivalent. *MacKellar.*

631 *Atomic Structure.* (3)
A lecture and problem course treating the theory of atomic structure. Topics include atomic and molecular spectra, multiplet structure, interatomic and intermolecular forces, and quantum mechanical treatment of the vector model. Prereq: PHY 714 or equivalent. *Knight.*

632 *Statistical Mechanics.* (3)
A lecture and problem course dealing with the thermal properties of matter from the standpoint of statistical mechanics. Topics include thermodynamic properties, perfect gases, and Fermi-Dirac statistics. Prereq: PHY 522 and 604. *Philhours.*

639, 640 *Theoretical Astrophysics.* (3 ea.)
A study of those branches of physics which have thus far proved most useful in astronomical applications and a thorough treatment of several major astronomical problems which have been elucidated by these methods. Prereq: PHY 504, 611. *DeMarcus.*

650 *Theory of Relativity.* (3)
A lecture and problem course dealing with the special and general theories of relativity. Topics include relativistic kinematics, the Lorentz transformation, the principle of equivalence, Riemannian spaces, field equations and experimental tests of the special and general theories. Prereq: PHY 604. *Staff.*

651 *Physics of Elementary Particles.* (3)
A lecture and problem course treating the subjects of fundamental particle classification schemes, high energy accelerators and detectors, introduction to meson field theory, pion nucleon interactions, and strange particles. Prereq: PHY 555, 617. *Staff.*

652 *Theory of Elementary Particles.* (3)
A lecture and problem course dealing with the application of modern theoretical concepts to elementary particle systems. Prereq: PHY 714. *Staff.*

682 *Electronic Phenomena in Gases.* (3)
Considers basic phenomena of the motion and interaction of electrons in gases including ion formation, mobility, diffusion, recombination, ion lifetimes, atomic and molecular excitations and energetics. Prereq: PHY 417, 510 or 554; MA 214. *Hurst.*

706 *Methods of Mathematical Physics.* (3)
Solution of physical problems systematized according to the equations they satisfy. Variational methods, boundary conditions, eigenfunctions, Green's functions, integral representations, approximation procedures, with applications from electromagnetic theory, quantum mechanics, acoustics. Prereq: consent of instructor. *VanWinter.*

714 *Quantum Mechanics I.* (3)
A lecture course covering a brief review of the origin of quantum theories, mathematical techniques of quantum mechanics, the general aspects of wave mechanics and matrix mechanics, the uncertainty principle. *Butler.*

715 *Quantum Mechanics II.* (3)
A continuation of 714 with extensions into special methods of solving problems in the theory, problems in more than one dimension, and the Pauli and Dirac theories of the electron. Prereq: PHY 714 or equivalent. *Butler.*

716 *Advanced Quantum Mechanics.* (3)
A continuation of PHY 715. Topics covered will include the relativistic wave equations, second quantization, quantum electrodynamics. Prereq: PHY 715. *Staff.*

755 *Topics in Chemical Physics.* (Subtitle required) (3)
An introduction to current research areas in chemical physics. Topics may include theory of atomic spectra, atomic and molecular processes, molecular theory, electrons and phonons in crystals, and optical properties of metals. Lectures, 2 or 3 hours. Prereq: Consent of instructor. May be repeated to a total of 12 credits. (Same as CHE 755.) *Ritchie.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

770 *Seminar.* (1)
A weekly meeting of the staff and advanced students for the discussion of recent developments in physics and of work in progress in the department. Credit is given to those who satisfactorily present papers. May be repeated to a maximum of eight credits. *Senior Staff.*

781 *Independent Work in Physics.* (3)
May be repeated to a maximum of 12 credits. Prereq: Major and a standing of 3.0 in department. *Senior Staff.*

790 *Research in Physics.* (3)
May be repeated to a maximum of six credits. *Senior Staff.*

791 *Research in Physics.* (5)
May be repeated to a maximum of ten credits. *Senior Staff.*

ASTRONOMY

492 *Galactic Astronomy II.* (3)
Study of the content, organization and evolution of our own and other galaxies. Prereq: Consent of the instructor. AST 292. *Krogdahl.*

495 *Elementary Astrophysics I.* (3)
Applications of the principles of elementary physics to the problems of stellar and planetary interiors. Prereq: PHY 232. *Krogdahl.*

496 *Elementary Astrophysics II.* (3)
Applications of the principles of elementary physics to the problems of stellar atmospheres and interstellar matter. Prereq: AST 495. *Krogdahl.*

591 *Cosmology I.* (3)
Consideration of observational basis of cosmology, cosmological theories of general relativity, the steady state theory, and kinematic relativity. Prereq: MA 213. *Krogdahl.*

592 *Cosmology II.* (3)
A study of the universe as a complete physical unit. Consideration of the various relativistic models and theory evaluation in the light of current observations. Prereq: AST 591. *Krogdahl.*

593 *Advanced Celestial Mechanics.* (3)
The three—and n-body problems; special solutions; potential theory. Prereq: AST 391 or equivalent. *Krogdahl.*

POLITICAL SCIENCE

Graduates of accredited colleges may become candidates for a Master's degree in Political Science. The degree may be earned under two plans: Plan A requires 24 semester hours and a thesis; Plan B requires 30 semester hours and a written examination in four fields in lieu of a thesis.

At least two-thirds of the semester hours required for the Master's degree must be taken in Political Science. At least one-half of the work in Political Science must be in courses open only to graduate students.

Students who are deficient in Political Science background must take such additional courses as may be recommended by the Department.

Admission to candidacy for the Doctor's degree in Political Science is governed by the regulations of the Graduate School. These regulations require a qualifying examination taken by the candidate during or after his fourth semester of full-time graduate study or its equivalent in those fields considered relevant to his program, such determination of fields to be made by the candidate's program committee. Normally, twenty-four of the total semester hours presented by the candidate must be in strictly graduate courses. Candidates for either a Master's or a Doctor's degree in Political Science are expected to have a knowledge of the related social sciences as a background for work in political science.

Candidates for the Ph.D. in Political Science are required to pass written examinations in two (2) foreign languages or to demonstrate a reading knowledge of one modern foreign language and proficiency in an allied field contributing to research competency in political science, such proficiency to be determined by the Director of Graduate Study, or by successfully completing at least six (6) hours of course work in the allied area(s). The allied fields presently approved by the Department of Political Science are (1) Statistics, (2) Research Methods, and (3) Computer Sciences. At least six (6) graduate hours in any one or a combination of these areas may be substituted for one foreign language upon the recommendation of the student's Special Committee and approval of the Director of Graduate Study.

Upon completion of the above requirements, the candidate must take an oral examination covering primarily the dissertation and the field in which the dissertation falls.

Additional details concerning departmental requirements may be secured from the Chairman of the department.

501 *Latin American Relations.* (3) II
The relations between the United States and the Latin American countries with emphasis on the Monroe Doctrine and Pan Americanism.

520 *Government and Politics of South Asia.* (3)
A study of the political processes of India, Pakistan, and Ceylon.

521 *Government and Politics of Southeast Asia.* (3) I
Study of the political processes, problems and behavior of the several states of Southeast Asia with emphasis on their chief determinants. Patterns of political development will be examined. Three lecture hours per week.

530 *The Conduct of American Foreign Relations.* (3) I, II
The formulation, conduct, and control of American foreign policy, basic principles, comparison with other countries. Prereq: PS 151.

531 *National Security Policy.* (3) I
The organization and formulation of military policy; the theory and practice of deterrence; and the problems of disarmament and arms control. Prereq: PS 265.

540 *Rural Local Government.* (3) I, S
Study of the organization and functioning of units of local government, with primary emphasis on government in Kentucky counties.

541 *The Foreign Policy of the Soviet Union.* (3) I, II
A factual survey of the Soviet record in foreign affairs and an introduction to the guiding concepts and principal techniques of Soviet foreign policy; the role of Communist ideology. Prereq: PS 556, or consent of instructor.

551 *Comparative Foreign Policies.* (3)
This course will emphasize comparative analysis and the development of propositions to explain why states behave as they do. Lecture, three hours. Prereq: PS 265 or consent of instructor.

552 *Municipal Government.* (3) I
An introductory course in the study of the structure and functions of modern city governments with some attention to other forms of local government.

553 *Urban Government and Politics.* (3) I
An analysis of the formulation of public policy in small towns, middle-sized cities, and metropolitan areas. A theoretical model appropriate to all three settings will be formulated. The principal methods of studying community decision-making will be evaluated.

554 *Survey of Sub-Saharan Politics.* (3) I
A survey of Sub-Saharan government and politics intended to give the student broad knowledge about the setting of African politics, pre-colonial African political systems, the political legacies of major European colonial powers, and problems of political development.

555 *Comparative Government: Parliamentary Democracies.* (3) I, S
A study of the governments of Great Britain and the Dominions, France, and Scandinavia.

556 *Government and Politics of the Soviet Union.* (3) I, II
Analysis of political development in the Soviet Union with emphasis on party-government relations, Communist ideology, and major approaches to the study of Soviet politics.

557 *Government & Politics in Sub-Saharan Africa.* (3)
The course will focus on the relationship between ideologies, institutions, and individuals in African political systems. Implications of these factors for African political behavior (domestic and international) will be examined. Prereq: PS 554.

559 *Constitutional Politics I.* (3) I
A survey of the interpretation of the Constitution as embodied in leading Supreme Court decisions. Concentrates upon (1) the substantive nature of constitutional doctrine, and (2) its relationship to political, economic and social trends.

560 *Constitutional Politics II.* (3) II
A study of the philosophy and development of civil liberties in the U. S. Major concentration on the interpretation of constitutional guarantees by the Supreme Court.

563 *The American Judicial Process.* (3) I
A study, from the standpoint of the social sciences, of the judicial process at the state and national levels, dealing with the organization of courts, the making of judicial decisions, and the exercising of judicial power.

566 *The United Nations.* (3) II
Background of the United Nations. Problems and issues at the San Francisco Conference; analysis of charter and comparison with League of National Covenant; nature, structure and functions.

568 *The Governments and Politics of Eastern Asia.* (3) I, S
A comparative analysis of the modern political experiences of China and Japan, exploring their responses to the West, the development of differing political elites in each country, and contemporary problems of the Chinese Communist and Japanese politics.

569 *Latin American Government and Politics.* (3) I
A study of contemporary Latin American political institutions and of the dynamics of the Latin American political process.

570 *Political Parties.* (3) I, II
An analysis of pressure groups; organization, methods and functions of political parties in the United States.

571 *Early Political Theory.* (3) I, II
The history of political theory from classical Greece to the 17th century with emphasis on the relationships between political and cultural change and the development of Western political thought.

572 *Modern Political Theory.* (3) I, II
Political theory from the 17th century to the present with emphasis on the development of contemporary ideologies, the impact of industrialism and modern science, and the relationships between modern democracy and dictatorship.

573 *Public Opinion.* (3) II
A study of the nature of public opinion and its influence in government, the role of the press, and other media, propaganda techniques, and voting behavior.

574 *Kentucky Government and Constitution.* (3) II
An intensive study of government and administration in Kentucky. The course is intended primarily for teachers of civics in the secondary schools and for teachers of government in college.

575 *American Political Thought.* (3) I
Analysis of the development of American political thought especially as it relates to the role of government in the society.

576 *Legislative Process.* (3) II
A study of Congress and the state legislatures, covering the legislative power structure, the selection of legislators and the roles they play, decision-making, and the relations of the legislative and executive branches.

577 *Introduction to Public Administration.* (3) I, II
A study of theories of administration and organization, problems of line management and control, the principal staff and auxiliary functions and agencies, and the problem of administrative responsibilities under democratic government.

578 *Public Personnel Administration.* (3) II
A study of the history of the merit system in public administration, recruitment, position classification, pay policies, employee relations and morale, tenure, promotion, transfer and training in the public service; the role of the personnel officer.

579 *Public Policy for Private Enterprise.* (3) II
A study of the development and implementation of government regulatory policy with major emphasis in the fields of anti-trust and public utilities.

610 *Comparative Politics: Theory and Method.* (3) I
A study of the evolution and development of comparative government and politics within the discipline with particular emphasis upon the formulation, application, and limitations of the theories, taxonomies and conceptual frameworks employed in comparative research.

654 *Pro-Seminar in Judicial Process.* (3) I
A thorough survey of the recent literature in the judicial process, focusing particularly on judicial recruitment, the relationship of the judicial to other power centers, and the decision-making process of judges.

671 *Introduction to Methods and Methodology in Political Science I.* (3) I
Analysis of the application of scientific method to the study of political phenomena; problems of concept formation; law, cause, and explanation; theory construction; and the place of values in political inquiry.

672 *Introduction to Methods and Methodology in Political Science II.* (3) II
Consideration of various modes of conducting research in political science. Focus on research techniques, applications, and theory building. Prereq: PS 671.

674 *Proseminar in Theories of International Politics.* (3) II
A survey of the major theoretical approaches to the study of international systems and processes.

680 *Proseminar in American Political Systems and Process.* (3) I
A thorough survey of recent literature on the political systems at all levels of American government, including political parties, the legislative and executive process, and local power structures and decision-making.

751 *Seminar in Metropolitics.* (3)
Overview of research on metropolitan government and politics; power structures, voting behavior and election in metropolitan areas; emphasis on student research in metropolitan problems. Prereq: PS 553 or permission of instructor.

752 *Problems in State and Local Government.* (3) II
An intensive study of the basic problems of state and local government. Special emphasis on such current problems as are of functional importance. May be repeated once.

757 *Seminar in Comparative Democratic Political Systems.* (3)
An analysis of democratic political systems with emphasis upon the comparative approach as a method of political analysis. Prereq: PS 555 or consent of instructor.

758 *Seminar in Soviet Politics, Government, and Foreign Policy.* (3)
Emphasis on methodology of various approaches to the study of the USSR as well as substantive research. Subjects will alternate yearly between Soviet politics and Soviet foreign policy. Prereq: PS 556; PS 541 or consent of instructor.

759 *Seminar in African Political Systems.* (3)
The seminar will focus on dimensions of change in African political systems. Dimensions to be analyzed include ideology, economic development, socialization, authority, political recruitment and political party and interest group behavior.

761 *The Constitution and Civil Rights.* (3) I
The American conception of civil rights as expounded by the Constitutional fathers and interpreted by the courts. The social, economic and political aspects and implications of these rights.

762 *Seminar in Judicial Policy Making.* (3) II
Formulation, development and implementation of Constitutional policy by the United States Supreme Court and other agencies. Primary focus on areas of contemporary (excluding civil rights). Cases and supporting materials. May be repeated once. Prereq: Permission of instructor.

763 *Seminar in Administrative Politics.* (3) II
The processes by which administrative agencies establish and enforce policy are analyzed in terms of both legal and political considerations and behavioral theory. Three class hours per week. Prereq: Consent of instructor.

764 *Research in Judicial Behavior.* (3) II
Participant research on selected substantive inquiries about judicial behavior; in depth examination of releated theory, methods and research strategies. Prereq: Permission of instructor.

768 *Residence Credit for Master's Degree.* (0)
May be repeated once.

769 *Residence Credit for Doctor's Degree.* (0)
May be repeated indefinitely.

770 *Seminar in Contemporary Political Theory.* (3) II, S
An intensive study of contemporary political ideologies. May be repeated once to a maximum of six credits.

772 *Advanced Problems in Research Methods.* (3) I
A seminar in selected topics; the application of mathematical models and advanced statistical techniques to political science data.

773 *Asian Political Theory.* (3) I
An examination of the major political thought patterns of ancient and contemporary Asia, with emphasis on India and China. Three class hours per week. Prereq: Consent of instructor.

776 *Political Development of Southeast Asia.* (3) II
Study of the processes of political change in Southeast Asia; concepts, approaches and methodology; problems of political development; research problems in studying political development in Southeast Asia. Prereq: Permission of instructor.

777 *Research Problems in International Relations.* (3) II
This seminar focuses on research strategies that can be utilized in dealing with problems in International Relations. May be repeated once with consent of instructor. Prereq: PS 774 or consent of instructor.

778 *Seminar In Comparative Foreign Policies.* (3) I
Emphasis upon internal and external factors impinging upon decision-making in the area of foreign policy. May be repeated once with consent of instructor.

779 *Voting Behavior.* (3) I
A study of recent research in the field of voting behavior, including analysis of survey research techniques. Prereq: An undergraduate course in parties or public opinion, or consent of instructor.

780 *Legislative Behavior.* (3) II
A study of recent research in the legislative process, emphasizing both the substantive and methodological aspects. Prereq: An upper-division course in the legislative process or consent of instructor.

784 *Seminar in Political Socialization.* (3) II
A course in contemporary research in the acquisition of political orientations. The focus is on children. The objects, agents, and consequences of political socialization are analyzed, as well as the processes by which it may proceed. Some attention is given to research design appropriate to the area. Prereq: Graduate student status.

785 *Psychological Bases of Political Behavior.* (3) II
The role of psychological constructs and theory in political explanation; measurement and inference problems; critical analysis of research concerned with such topics as the effect of psychological mechanisms on loyalty, quiescence, participation, political change, and revolution. Prereq: PS 671 and PS 672 or consent of instructor.

790 *Special Problems in Public Administration.* (3) I
A research course in selected problems of public administration. The problems will be chosen in accordance with the needs and desires of students registered for the course.

791 *The Organization as a Political System.* (3) I
This course involves an examination of theoretical concepts pertaining to the design of organizational structure and the prediction and control of administrative behavior, including detailed analysis of the models evolving from traditional, behavioral and decision-making approaches to the study of administrative organization. Major emphasis will be placed on such concepts as those relative to power and its allocations, leadership, representation and policy formation. Student work will include participation in field research projects as well as extensive reading in the field of organization theory. Prereq: PS 577 or equivalent.

795 *Special Problems in Political Science.* (3) I, II S
May be repeated once for a maximum of six credits.

PSYCHOLOGY

The major goal of the doctoral program in psychology is to prepare the student for a career in teaching and research in the fields of clinical, experimental, or social psychology. A master's degree in general psychology is also available.

The program in clinical psychology provides academic courses, practica, and an internship which permit the student to combine his teaching and research activities with a clinical career in the mental health field. Current areas of research interest include psychotherapy, behavior therapy, psychopathology, projective techniques, and experimental personality. Clinical experience is available at such facilities as the University of Kentucky Medical Center, the U.S. Veterans Administration Hospital, the National Institute of Mental Health Clinical Research Center, and various nearby state institutions.

The program in experimental psychology provides academic courses and

research experience in any of the following areas of concentration: learning, motivation, perception, developmental psychology, cognitive processes, and social psychology. Current areas of research interest include verbal learning, psycholinguistics, instrumental learning, classical conditioning, visual perception, discrimination learning in children, mathematical psychology, and social learning. Laboratories for the study of human and animal behavior with supporting shop and computer facilities are available.

The program in social psychology is designed to provide intensive experience in research with members of the social psychology faculty, with the aim of developing in the student a strong theoretical and research competence with complex social phenomena. Traditions of both experimental laboratory research and naturalistic study are utilized; emphases include theoretical and applied significance of research. Within broad limits set by the program, any given student's course of study is designed to fit his particular needs and interests. Course work in related behavioral sciences (for example, sociology, anthropology) is encouraged.

During the first year of the doctoral program, all students gain experience in the major content areas of psychology and in psychological statistics. Thereafter, the student and his adviser construct a program of study consistent with the academic interests and professional goals of the student. This program of study includes a minor in some field outside the Department of Psychology. A reading knowledge of one modern foreign language is required for Ph.D candidates.

The M.A. or M.S. degree is awarded under Plan A only.

The minimum departmental standards for admission to graduate work in psychology include an undergraduate department overall average of B or better, a satisfactory score on the verbal and quantitative aptitude tests of the Graduate Record Examination and three letters of recommendation. For additional information concerning the program in psychology and such matters as financial support, contact the Chairman, Department of Psychology.

501 *Personality.* (3) I, II

An examination of several prominent personality theories in terms of the contexts in which they were originated, their influence upon contemporary psychological thought, and their present applications. Prereq: PSY 104 and 106, or PSY 210, permission of instructor required for graduate students. Three class hours per week. *Worell.*

505 *Human Senses and Perception.* (4) I

A study of the stimulus, receptor and organism variables that underlie perceptual experience and perceptually based behavior with emphasis upon theory and experimental method. Prereq: PSY 104 and 106, or 210. *Engel.*

507 *Psychology of Learning.* (4) II

Fundamental principles and findings from laboratory investigations of classical, instrumental, and verbal learning. Prereq: PSY 104 and 106, or 210, and PSY 336 or equivalent. *Donahoe.*

509 *Animal Behavior.* (4) I

Experimental techniques used in investigations of animal behavior. Topics include: heredity and environment, activity, instinct, motivation, learning, sensory discrimination, and personality in subhuman species. Prereq: PSY 104 and 106, or 210. *Newbury.*

511 *Experimental Child Study.* (3) I

An advanced course in the psychology of the normal child. The scientific background of experimental and observation method. Opportunities are provided to work with children. Prereq: PSY 200. *Estes.*

520 *Mental Hygiene.* (3) II, S

A general orientation to the subject of mental hygiene, its historical development, its scope and relation to various sciences. The individual and cultural determinants of behavior will be discussed. Not open to students who have had CH 520. Prereq: PSY 104 and 106, or 210.

521 *Abnormal Psychology.* (3) I, II, S

A study of the major mental disorders, especially the psychoneuroses and the psychoses, and the biological, psychological, and sociological factors which contribute to their causation. Prereq: PSY 104 and 106, or 210. *Pattie.*

522 *Counseling Psychology.* (3) I

The methods of dealing with problems in counseling psychology in college and high school, including the problems of selection, classification, grading, personal adjustment, motivation, academic, vocational and personal counseling. Prereq: PSY 520 or 521. *Staff.*

523 *Psychology of the Criminal.* (2) I

A study of psychological factors involved in criminality, with special emphasis on the emotional and personality patterns underlying the life of the criminal, and the problems brought about by incarceration. Prereq: PSY 104 and 106, or 210.

530 *Biology of Motivation.* (2) I

Fundamental activating and goal-seeking processes of living organisms, biologically considered, including experimental and theoretical studies on such topics as instincts, drives, motives, and the taste preferences. Prereq: PSY 104 and 106, or 210. *Newbury.*

531 *Genetic Psychology.* (3) II

Influence of hereditary factors in the development of human behavior. A critical survey of the evidence regarding psychological traits such as musical and other special abilities, intelligence, and interests. Prereq: PSY 104 and 106, or 210. *Newbury.*

535 *Psychological Testing.* (3) I

A general orientation to the field of psychological testing. Introduction to the principles and methods of psychological testing, and a survey of the various kinds of psychological tests. Prereq: PSY 104 and 106, or 210 and 201. *Herron.*

540 *Introduction to Industrial Psychology.* (3) I

Review of the functions and findings of psychology applicable to business and industry. Topics covered are: employment procedures, personnel testing, attitude analysis, motivation, and morale. Prereq: PSY 104 and 106, or 210.

541 *Psychology of Industrial Personnel Procedures.* (3) II

A practical course for those preparing for personnel administration and for psychology in industry and business. A study is made of the theory and methods of position classification, job analysis, job evaluation, merit rating, supervisor selection and training, and collective bargaining. Prereq: PSY 104 and 106, or 210.

544 *Social Psychology.* (3) I, S

Theoretical and empirical analysis of individual behavior in the social setting with particular emphasis on social learning, motivation, and the measurement, formation, and changing of social attitudes. Prereq: PSY 104 and 106, or 210, SOC 101. (Same as SOC 544.)

545 *Small Group Behavior.* (3) II

Detailed theoretical and empirical analyses of small groups. The course systematically covers properties of groups and how these properties have been manipulated experimentally. Three class hours per week. Prereq: PSY 104 and 106, or 210, and an introductory course in sociology. *Lott.*

570 *Verbal Behavior.* (3) II
A broad coverage of several basic areas of human verbal behavior with particular emphasis on rote learning, memory and retention, associative processes, and psycholinguistics. Three class hours per week. Prereq: PSY 330 or 507. *Staff.*

579 *Stuttering.* (3) II
The nature, causes and treatment of stuttering, with emphasis on therapeutic procedures. Prereq: EDS 577. (Same as EDS 579.) *Sander.*

600 *Systems of Psychology and Their History.* (3) I
A survey of the history of psychology and an intensive study of current systems of psychology. *Pattie.*

601 *Theories of Learning.* (3) I
A systematic presentation and critical analysis of the major theories of learning. Prereq: PSY 505, 507, or equivalent, and 600.

602 *Theories of Personality.* (3) II
An examination of current theories of personality. The relation of these theories to psychological research will be examined. Prereq: PSY 505, 507 or equivalent, and 600.

603 *Psychopathology.* (3) II
An examination of the descriptive, theoretical, and research material relevant to the major classes of disturbed behavior. Special attention is devoted to the stylistic features of neurotic and psychotic communication and behavior. Prereq: Enrollment in the graduate program in psychology.

610 *Psychometrics.* (3) I
Analysis and interpretation of human measurements. The course deals with the computation and interpretation of simple, partial, and multiple correlations, regression equations, and reliability of measures. Prereq: A course in statistics. *Calvin.*

611 *Psychological Research.* (3) II
A study of the application of experimental methods in the major areas of psychology, including sensation and perception, learning, motivation, emotion, and personality. The design of research studies will be emphasized. Prereq: PSY 610. *Donahoe.*

616 *Research Design in Clinical Psychology.* (3)
Concentrates on current methodologies utilized in clinical research and on the application of sophisticated techniques to traditional research problems. Students are expected to master critical skills for the evaluation of research designs and are encouraged to explore creative approaches to research in important clinical areas. Prereq: Admission to graduate program.

617 *Experimental Approaches to Personality.* (3) I
A critical evaluation of experimental studies in selected areas in personality. Each student is required to design and conduct an empirical investigation of a specific problem. Two hours lecture, three hours lab per week. Prereq: Completion of one year of graduate program in Psychology or permission of instructor. *Worell.*

618 *Experimental Approaches to Psychopathology.* (3) I
A critical evaluation of experimental studies in selected areas of psychopathology. Each student is required to design and conduct an empirical investigation of a specific problem. Two class hours, three lab hours. Prereq: Completion of one year of graduate program in Psychology, or permission of instructor. *Harris.*

620 *Proseminar in Systematic Psychology.* (2)
An examination of some works of important theorists in psychology of the last 40 years. Prereq: PSY 507 or equivalent. *Staff.*

621 *Proseminar in Learning.* (2)
An intensive treatment of concepts, methodology, and current developments in the field of learning. Two class hours per week. Prereq: PSY 507 or equivalent. *Staff.*

622 *Proseminar in Personality.* (2)
An intensive treatment of theories, methods of investigation and current developments in the area of personality. Two class hours per week. Prereq: PSY 501 or equivalent. *Staff.*

623 *Proseminar in Sensation and Perception.* (2)
An intensive examination of the facts, methods and concepts involved in the study of sensory and perceptual processes. Two class hours per week. Prereq: Consent of instructor. *Engel.*

624 *Proseminar in Social Psychology.* (2)
An intensive examination of the methods and data of social psychology with emphasis on social attitudes. Two class hours per week. Prereq: PSY 544 or equivalent. *Lott.*

625 *Proseminar in Developmental Psychology.* (2)
An intensive treatment of theoretical and experimental literature, both classical and contemporary, in developmental psychology. Two class hours per week. Prereq: PSY 200 or equivalent. *Estes.*

629 *Introduction to Clinical Psychology.* (1)
Offered conjointly by the clinical faculty, covers the broad perspectives of clinical psychology, methods, history, ethics, and professional issues. Prereq: Enrollment in the graduate program in psychology.

630 *Clinical Methodology I.* (2)
An intensive survey and evaluation of tests of intelligence and objective methods of assessment of normal and abnormal personality. Special emphasis is given to major theoretical issues and relevant quantitative methods. Prereq: PSY 336, 501, 520, 535, or equivalent, and enrollment in graduate program in psychology.

631 *Practicum in Clinical Methodology I.* (2)
Clinical interviewing and practice in writing reports on behavioral observations, content of verbalization, and case history data. Practice in administration, scoring and interpretation of intelligence tests and objective personality tests. Four hours laboratory per week. Prereq: PSY 501, 521, and 535, or the equivalent, and enrollment in the graduate program in psychology. PSY 630 to be taken as co- or prerequisite.

632 *Clinical Methodology II.* (2)
Theoretical issues, quantitative methods and research findings on the projective methods of assessment of normal and abnormal personality. Prereq: PSY 630, and enrollment in the graduate program in psychology.

633 *Practicum in Clinical Methodology II.* (2)
Practice in the administration and scoring of projective techniques and batteries of clinical tests. Four hours of laboratory per week. Prereq: PSY 630 and 631, and enrollment in the graduate program in psychology. PSY 632 to be taken as co-or prerequisite.

634 *Practicum in Clinical Psychology III.* (3)
Administration, scoring, and interpretation of projective techniques and personality inventories, individually administered. Nine hours lab per week. Prereq: PSY 632 and 633, and enrollment in graduate program in clinical psychology.

635 *Practicum in Clinical Psychology IV.* (3)
Administration, scoring, and interpretation of batteries of clinical tests, with emphasis on organization of all relevant behavioral and test data, and professional report writing. Students will be assigned to local clinical installations. Nine hours lab per week. Prereq: PSY 634, and enrollment in graduate program in clinical Psychology.

636 *Systems of Psychotherapy.* (3)
An intensive examination of the major theoretical and research approaches to therapeutic behavior change. Prereq: PSY 632 and 633, and enrollment in graduate program in clinical psychology. *Berzins.*

637 *Practicum in Psychotherapy and Behavior Change.* (1-3)
Supervised experience in the techniques of psychotherapy with adults, children and groups, and in community mental health approaches. Laboratory two to six hours. Each clinical student must have a cumulative minimum of three supervisors. May be repeated to a maximum of six credits. Prereq: PSY 636, and enrollment in the graduate program in clinical psychology.

638 *Clinical Child Psychology.* (3)
Theory and research relevant to behavior problems of children; supervised experience in the diagnosis and therapy of children. Two hours lecture, two hours lab per week. Prereq: PSY 636 and 637 and enrollment in graduate program in clinical Psychology.

640 *Practice in Testing: Intelligence Tests.* (4) II
This course provides theoretical material and advanced laboratory practice in the measurement of intelligence by individual techniques. Lecture, 3 hrs.; lab., 2 hrs. Prereq: PSY 535 or equivalent. *Estes.*

641 *Psychological Measuring Instruments.* (3)
A study is made of a wide variety of psychological tests including group intelligence tests, personality and interest inventories, area aptitude tests, and special aptitude tests. Prereq: PSY 201.

642 *Principles of Test Construction.* (3)
A survey of the principles involved in different types of standardized tests, followed by the construction and item analysis of an original test by the student. Prereq: PSY 610.

643 *Test Standardization.* (3)
A continuation of 642. The student will administer a revised form of his preliminary test to an adequate sampling of the appropriate population and will determine its reliability and validity. Prereq: PSY 642.

647 *Disorders of Language.* (3)
Emphasis on adult aphasia and developmental language disabilities, theories, research findings, assessment procedures, and therapy approaches. Three class hours per week. (Same as EDS 647.)

650 *Diagnosis and Counseling in Counseling Psychology.* (3)
An advanced course in diagnosis and application of theories, techniques and tools in counseling psychology. Prereq: A graduate major in psychology or education.

662 *Practicum in Child Psychology.* (3) I, II
Nine hours of supervised work each week. May be repeated to a maximum of twelve credits. *Estes.*

663 *Practicum in Industrial Psychology.* (3)
May be repeated to a maximum of twelve credits. Nine hours of supervised work each week.

665 *Practicum in Counseling Psychology.* (3) I, II, S
Supervised experience in application of diagnostic and interviewing techniques in a counseling service. May be repeated to a maximum of twelve credits. (Same as EDP 665.) Prereq: PSY 522.

700 *Seminar in Behavior Modification.* (3)
Considers the general behavioristic orientation, history, theoretical foundations, research investigations and case study material related to clinical approaches to behavior modification. Prereq: Enrollment in the graduate program in clinical psychology and consent of instructor.

701 *Seminar in Clinical Child Psychology.* (3)
Theory and research relevant to behavior problems of children. Prereq: Enrollment in graduate program and consent of instructor.

702 *Seminar in Community Mental Health.* (3)
Considers psychological intervention and the application of psychological principles to community problems in terms of problem definition, program development, program funding, assessment and evaluation. Emphasis is on the application of research findings to community problems in ways which permit adequate evaluation of the program's effectiveness. Prereq: Enrollment in the graduate program and consent of the instructor.

703 *Seminar in Group Therapy.* (3)
An examination of the major theoretical and research approaches to individual behavior change within a group. Prereq: Enrollment in the graduate program in clinical psychology and consent of the instructor.

704 *Seminar in Hypnosis.* (3)
A survey of the facts, theories, and therapeutic applications of hypnosis. Prereq: Enrollment in the graduate program in clinical psychology and consent of the instructor.

705 *Research in Psychotherapy and Behavior Change.* (3)
A critical examination of experimental studies in selected areas of psychotherapy and behavior change. Prereq: Enrollment in the graduate program in clinical psychology and consent of the instructor.

710 *Seminar in Clinical Psychology.* (3)
A selected topics course designed to cover content areas which are not being met by the current faculty; may be taught by persons with special qualifications from the community or by existing faculty exploring new areas. The topics, which may be offered as the need arises, may include, on a semester basis, mental retardation, intensive psychoanalytic theory, psychopharmacology, etc. Prereq: Enrollment in graduate program and consent of instructor.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

770 *Seminar in Psychology I.* (0) I, II
One two-hour discussion each week of some current systematic concepts and of research under investigation by a graduate student or staff member. May be repeated indefinitely. *Staff.*

771 *Seminar in Psychology II.* (0) I, II
One two-hour discussion each week of some current systematic concepts and of research under investigation by a graduate student of staff member. For Ph.D. candidates. May be repeated indefinitely. *Staff.*

772 *Seminar in Learning.* (3) I
The study of selected topics in the learning area with emphasis on the recent experimental and theoretical literature. May be repeated to a maximum of 6 credits. Prereq: PSY 507 and consent of instructor. *Donahoe.*

774 *Seminar in Verbal Behavior.* (3)
The study of selected topics in the area of verbal behavior with emphasis on recent research and theory. May be repeated to a maximum of 6 credits. Prereq: Consent of instructor.

775 *Advanced Seminar in Perception.* (3)
A study of the major theoretical approaches to perception and an examination of critical experiments and well established phenomena in the field of perception from the vantage-point of these theories. Three class hours per week. Prereq: PSY 623 or equivalent. *Engel.*

776 *Seminar in Animal Motivation.* (3)
A variety of topics in motivation and unlearned behavioral determinants in sub-human species will be treated intensively in comprehensive reports based on the research literature and related to such problems as instinct, drive theory, activation, stress, work decrement and neural components. Human implications may also be considered. Prereq: Consent of instructor. *Newbury.*

777 *Seminar in Mathematical Psychology.* (3)
Topics in psychology which are receiving detailed mathematical analysis. Examples are mathematical learning theory, decision and judgment processes, advanced application of probability and statistics in psychological theory. Prereq: PSY 610. *Calvin.*

778 *Seminar in Child Psychology.* (3)
Topics in psychological development of the individual, e.g., learning, sex typing, identification, emotional problems, mental retardation, theories of infant care, achievement motivation, etc. Prereq: PSY 200 or equivalent. *Estes.*

779 *Seminar in Social Psychology.* (3) II
Each semester some topic in the field of social psychology, such as attitudes and beliefs, structure and function of social groups, social determinants of behavior, leadership, and morale will be studied intensively. (Same as SOC 779.) May be repeated to a maximum of six credits. Prereq: PSY 544; SOC 101. *Lott.*

780 *Problems in Psychology.* (2) I, II, S
Shorter research problems are registered under this number. A minimum of six hours per week is required in consultation with the instructor. May be repeated to a maximum of twelve credits. *Staff.*

781 *Research Participation.* (1)
Emphasis on the team approach to research. Designed primarily for first year graduate students, but may be repeated to a maximum of four credits. Laboratory, 2-4 hours per week. Prereq: Enrollment in the graduate program in psychology.

790 *Research in Psychology.* (3) I, II, S
Research or thesis work may be registered under this number. A minimum of nine hours a week is required on research conducted in consultation with the instructor. May be repeated to a maximum of twelve credits. *Staff.*

SLAVIC AND ORIENTAL LANGUAGES AND LITERATURES

At present no graduate degrees are offered in these subjects. The following courses are available to students in other graduate programs.

RUSSIAN

461 *Advanced Readings in Russian Literature.* (3)
Based on the reading of 19th century and 20th century short stories and plays by Russian masters. Intended for students desiring to combine extensive reading with oral and written expression. Particular emphasis will be placed on advanced grammar and syntax. Prereq: SO 367, 368. *Dechtiarenko.*

462 *Advanced Readings in Russian Literature.* (3)
A continuation of SO 461. Prereq: SO 461 or equivalent. *Dechtiarenko.*

463 *Russian Drama* (in Russian). (3)
A survey of the growth and development of the Russian drama, with special emphasis on the outstanding dramatists of the 18th, 19th and the beginning of the 20th centuries. Three class hours per week. Prereq: SO 367 or permission of instructor. *Dechtiarenko.*

464 *Survey of Russian Literature to 1800* (in Russian). (3)
An introduction to the literature of Russia from earliest times to Pushkin. The emphasis will be on 18th century authors. Three class hours per week. Prereq: SO 367, 368, or consent of instructor. *Dechtiarenko.*

563 *Tolstoy and Dostoevsky.* (in English) (open to non-majors) (3)
A study of the period, significant works, influence at home and abroad. Lectures, oral and written reports, class discussions. Required of majors in addition to 24 hours of courses in Russian. Three class hours per week. *Fayer.*

SEMITICS

576, 577 *Studies in Semitic Philology.* (3 ea.)
Courses to meet the needs of students in various areas of Semitic Philology, e.g., in literature, in civilization, linguistics, etc. Three class hours per week. Prereq: Consent of instructor. *Staff.*

SOCIOLOGY

Graduates from accredited colleges who meet the requirements of the Graduate Program in Sociology and the Graduate School may work toward the following advanced degrees with major work in sociology; Master of Arts, Master of Science in Agriculture, and Doctor of Philosophy. Students not planning to work for the doctorate may qualify for the M.A. under Plan B. Only one modern foreign language is required for the Ph.D. degree in sociology.

Graduate students pursuing the Ph.D. degree are expected to choose a specialty area within sociology and to select a minor area outside the department. Areas of specialization in sociology currently stressed are: community and social organization; deviant behavior; family; medical sociology; population; social change and development; and social institutions, which includes study of two or more sub-areas such as sociology of religion, political sociology, educational sociology, and economic and industrial sociology. While core seminars in these specialties are offered, individual program flexibility is maintained so that a student may develop his own interests.

To aid in financing graduate education, a considerable number of assistantships, fellowships and other stipends are available to qualified students.

Sociologists at the University of Kentucky carry on a substantial variety of research projects, consultative activities, extension education programs and community services. Through affiliations with nearby institutions, specialized experience and training is available to graduate students. The Clinical Research Center and National Institute of Mental Health located near Lexington offer research assistantships for work on problems of addiction.

Research opportunities within the prisons and other correctional institutions of the state may be arranged. Experience is available in rural sociological research at the Agricultural Experiment Station. Opportunity for applied sociology experience in the Cooperative Extension Service is also available.

The department participates in the University's Center for Developmental Change, which is devoted to interdisciplinary research and training in planned change. The Department of Behavioral Science, College of Medicine, includes sociologists on its staff and conducts research and other activities of a sociological

nature. Sociology graduate students with appropriate interests and training are eligible for assistantships and other appointments in these fields.

Department standards for admission to graduate work in sociology are similar to those of the Graduate School, including satisfactory scores on the verbal and quantitative tests of the Graduate Record Examination. Three letters of recommendation, a statement of educational and career goals, and a special departmental application are required. For additional information on departmental requirements and opportunities for financial assistance, write to the Director of Graduate Study in Sociology.

413 *Community Analysis.* (3)
A study of communal structure and processes with special emphasis on strategies of field investigation of particular communities. Prereq: SOC 101 or equivalent or consent of instructor.

441 *Group Organization and Leadership.* (3)
A study of the structure and dynamics of organized groups; leadership, membership participation, and the processes of problem-solving and group development. Prereq: SOC 101 or consent of instructor.

501 *Population Analysis.* (3) I
Distribution and composition, fertility and mortality, migration, ecological relationships and growth of population. Prereq: SOC 101 or consent of instructor.

502 *Methods of Demographic Analysis.* (3) I
Application of statistical techniques employed in the analysis of census and vital statistics data, including methods of population standardization, life table construction, and preparation of population estimates. Prereq. or taken concurrently: SOC 501 and one of the following statistics courses: ECO 291, AEC 530; SOC 101.

503 *Social Classes.* (3) I
A systematic treatment of the factors underlying social differentiation and stratification, with particular attention to class and caste; social mobility in American society. Prereq: SOC 101 or consent of instructor. *Wilkinson.*

509 *The Family.* (3) I, II, S
A study of the institutions of marriage and the family and an analysis of the various factors and forces at work in our time which are affecting the individual marital relationship. Prereq: SOC 101 or consent of instructor. *Gladden, Kenkel.*

510 *The Family.* (3) II, S
A study of the various social situations in which children grow to early adolescence with emphasis on the primary group relationships in home, neighborhood, play group, and school. Prereq: SOC 509 or permission of instructor; SOC 101. *Gladden, Mirande.*

515 *Diffusion of Technology in Modern Society.* (3)
A study of the personality, social structure and change agent factors in the spread of new techniques among groups and individuals in modern society. Prereq: Either GEN 102 or SOC 101, 153.

517 *Rural Sociology.* (3)
Systematic study of the structure and function of family, informal and locality groups, social strata, religious, educational, political and occupational groups in rural society. Prereq: GEN 102 or SOC 101.

518 *Social Change.* (3) I
A sociological analysis of the sources, processes and consequences of social change. Three class hours per week. Prereq: SOC 101. *Stephenson.*

519 *Sociology of Urban Life.* (3) II

This course is a study of the sociology of city life. The major emphasis is upon the ecological and social characteristics of urban life in contrast to rural community life. Prereq: SOC 101 or consent of instructor. *Sutton, Jordan.*

521 *Industrial Sociology.* (3)

A sociological analysis of the division of labor, the characteristics of occupational groupings; principal socio-economic movements, and group relationships in modern industry. Prereq: SOC 101 or consent of instructor. *Shepard.*

522 *Sociology of Complex Organizations.* (3)

An intensive study of intra- and interorganizational structures and processes. Special emphasis is given to emergence, maintenance, and change of bureaucratic and non-bureaucratic organizations and the impact of organizations on individuals. Three class hours per week. Prereq: Six hours of SOC or consent of instructor; SOC 101. *Barlow.*

523 *Social Determinants of Economic Behavior.* (3) II

A study of the sociology of consumption, the effect of social values upon business and employee behavior, and the socio-economic implications of welfare legislation. (Same as ECO 523.) Prereq: SOC 101 or consent of instructor. *Staff.*

525 *Religion and Culture.* (3) I

An analysis of the structure, function, and process of religion, using the development of the Hebrew and Christian religions to show social origins of the two faiths and the effect of cultural change on their growth. Prereq: SOC 101 or consent of instructor. *Gladden.*

526 *Culture and Personality.* (3)

The cultural basis of personality. Personal character considered as the result of culturally fostered patterns. The ideal personality in several selected societies. (Same as ANT 526). Prereq: SOC 101. *Essene.*

527 *Society and Health.* (3) II

The study of human behavior in illness and of medicine as a complex form of social organization in perspective of historical, cross-cultural and contemporary analysis. This course is designed primarily for students preparing for careers in an allied health science or profession. (Same as BSC 527.) Prereq: SOC 101. *Straus, Hall.*

529 *Political Sociology.* (3) I

A study of the sociological aspects of political systems, movements and ideologies. Special attention is given to comparative analysis of parties, pressure groups, voting patterns, elites, bureaucracy, political socialization, mass politics and the role of intellectuals. Prereq: Six hours of sociology or consent of instructor; SOC 101. *Drysdale.*

531 *Sociological Analysis of American Society.* (3)

A study of the contemporary U.S.A. with emphasis upon the changing relations among various aspects of American society and culture. Prereq: SOC 101 or consent of instructor. *Brown.*

532 *Intergroup Relations.* (3) I, S

Analysis of relationships between groups which differ in religious, ethnic, or socio-cultural backgrounds; the development of educational and social techniques for reduction of tensions. (Same as EDF 532.) May be repeated to a maximum of six credits. Prereq: SOC 101. *Coleman.*

533 *Social Anthropology.* (3) II

History and theory of social anthropology with special emphasis on the comparative approach to analysis of structure, function, and change in social and cultural systems. Prereq: Consent of instructor; SOC 101. (Same as ANT 533.) *Pearsall.*

536 *Sociology of Deviant Behavior.* (3) I

A systematic examination of the various types of social disorganization, with particular emphasis upon the sociological explanation of underlying factors. Prereq: SOC 101 or consent of instructor. *Voss, Burkett.*

537 *Criminology.* (3) I, II
A study of general conditions as to crime and delinquency, of measures of punishment and reform of offenders, of criminal procedure and its possible reform, and of measures for the prevention of crime. Prereq: SOC 101 or consent of instructor. *Voss, Barlow.*

538 *Juvenile Delinquency.* (3) I, II
Study of the extent, ecological distribution, and etiology of delinquency in contemporary American society, including a critical examination of trends and methods of treatment. Prereq: SOC 101 or consent of instructor. *Burkett.*

539 *Sociology of Corrections.* (3) II
A study of correctional practices, including the issues of punishment versus treatment of offenders, probation and parole as methods of treatment, the social structure of the institution and its impact on the offenders, and specific programs and experiments in institutional and community treatment. Prereq: SOC 101. Rec: SOC 537 or 538.

542 *Human Relations in Administration.* (3)
Analysis of the role of social structure, leadership, authority, power, and psychological stress in the administration of large-scale organization in the United States. Prereq: SOC 101 or consent of instructor. *Youmans.*

544 *Social Psychology.* (3)
Theoretical and empirical analysis of individual behavior in the social setting with particular emphasis on social learning, motivation, and the measurement, formation, and changing of social attitudes. (Same as PSY 544.) Prereq: PSY 104 or 210; SOC 101. *Lott.*

546 *Social Factors in Mental Health.* (3) I
The significance of social and cultural factors in the recognition, course, and management of mental health problems; social organization of the mental hospital and cultural alternatives to hospitalization. Prereq: prior course work in sociology, anthropology, or psychology and permission of instructor; SOC 101. (Same as BSC 546.) *Gallagher.*

547 *The Sociology of Aging.* (3)
Analysis of demographic and institutional patterns, social roles, psychological and physiological changes, and rehabilitative and educational programs associated with aging. Prereq: SOC 101 or consent of instructor. *Youmans.*

548 *The Sociology of Public Opinion.* (3) II
Introduction to the study of public opinion, its role in the society and its functions for the individual. Propaganda and other mass persuasion techniques are examined as these relate to the formation, alternation or maintenance of public opinion. Prereq: SOC 101 or consent of instructor.

549 *Sociological Aspects of Mass Communication.* (3) I
The relationship between the organization of modern society and its communication media: Special emphasis is given to the way in which cultural processes and social change have an impact upon the mass media, and upon the way in which the mass media influence cultural processes and social change. The social-psychological bases of communication are studied within a context of theory and research. (Same as EDC 549.) Prereq: SOC 101 or consent of instructor. *Wilkinson.*

551 *Principles of Sociology.* (3) I, II, S
A survey of the basic elements of culture, collective behavior, communities, social institutions, and social change. Basic concepts required for the analysis of sociological data are systematically considered. Prereq: SOC 101 or consent of instructor. *Stephenson, Jordan.*

561 *Comparative Sociology.* (3) I
Two or more societies are analyzed and compared sociologically. The specific societies considered may vary from time to time; for example, Soviet and American society; the middle Eastern countries; Latin America societies, etc. Prereq: SOC 101 or consent of instructor. *Staff.*

565 *Special Problems in Sociology.* (1-3)
Supervised individual study in selected sub-fields of sociology, population, community, organizations, social attitudes, deviant behavior, and social change are among the fields available for investigation. May be repeated to a maximum of six credits. Prereq: SOC 101.

571 *Contemporary Sociology.* (3) I
A survey of the current state and organization of sociology as indicated by consideration of the main fields of sociology and developments in each. Most of the staff participate as special lecturers in their specialty. Prereq: Major or minor in Sociology and nine hours in Sociology; SOC 101. *Coleman.*

581 *Techniques of Social Investigation.* (3) I, II
A study of the practical applications of sociology in organizing, conducting, and interpreting social surveys and other forms of sociological research. Prereq: SOC 101 and an introductory course in Statistics.

615 *Rural Urban Relations.* (3)
Interdependence of city and country; solidary and antagonistic relationships of city and country; the process of urbanization, and problems of rural adjustment to urban influences. Prereq: SOC 101. *Brown.*

625 *Sociology of Religion.* (3)
Critical study of reciprocal relation of religion and culture, the function of religion in society, social sources of religious concepts, religious differentiation and institutionalization, the problem of church and state. Prereq: SOC 101. *Gladden.*

632 *Minority Groups.* (3)
A sociological scheme of analysis is applied to the special problems of adjustment arising from ethnic group relations and culture contacts. Prereq: SOC 101. *Coleman.*

651 *Systematic Sociology.* (3) I
An intensive study of certain selected sociological theorists such as Weber, Durkheim, Simmel, Pareto, and others. Prereq: SOC 101.

661 *Educational Sociology.* (3) II, S
A course in the sociological foundations of education. (Same as EDF 661.) Prereq: SOC 101. *Staff.*

670 *Seminar on Role Theory.* (3) I
An exploration of differences and similarities in the utilization of the concept of role in Sociology, Anthropology and Psychology. Emphasis is placed on the potentiality of role as a unifying concept in the behavioral sciences. Three class hours per week. Prereq: Consent of instructor; SOC 101. (Same as BSC 670 and ANT 670.)

671 *Seminar in Contemporary Sociology.* (0) I
Each member of the Department of Sociology presents a summary of his past and present research and his current interests. The purpose is to acquaint the student with the wide range of interests, projects and personnel in his graduate department. Prereq: SOC 101. *Staff.*

681 *Research Design and Analysis.* (3) I
Problem definition and delimitation, design appropriate to problem and data, and selection of appropriate analysis techniques; critical examination of representative research studies and students' designs. Prereq: Elementary Statistics and SOC 581 or equivalent; SOC 101. *Ford.*

685 *Integration of Theory and Research.* (3) I
Systematic analysis of problems related to the verification of sociological theory through empirical research. Prereq: SOC 681; SOC 101. *Staff.*

690 *Community Action Analysis.* (3) II
The structure and dynamics of complex, collective actions are analyzed in terms of their social and cultural characteristics and their temporal patterns. Lecture, three hours per week. Prereq: SOC 101. *Sutton.*

702 *Seminar in Social Demography.* (3) II
A seminar designed to explore the relations between sociology and demography. Emphasis is given to the influence of social factors on demographic behavior and to the utilization of population data and demographic techniques in the investigation of sociological problems. Prereq: SOC 501 or equivalent; SOC 101. *Ford.*

720 *Seminar in Community Theories.* (3) I
An intensive examination of selected theories and writings relevant to an understanding of territorial communities. Includes a study of the writings of Durkheim, Park, Redfield, Warner, and others. Prereq: SOC 101.

727 *Seminar on Socio-Cultural Change.* (3)
A seminar for advanced students. Emphasizes economic, religious, political, technological, psychological, etc., factors in change, and social and cultural patterns and processes of change. Prereq: ANT 527 or SOC 518, or permission of instructor; SOC 101. (Same as ANT 727.) *Staff.*

731 *Seminar in Comparative Social Organization.* (2) II
A seminar for advanced students. Emphasizes principles in the comparative study of social systems; the role of kinship, age, sex, locality, and voluntary associations in determining relationships between individuals and between groups in non-literate and literate societies. (Same as ANT 731.) May be repeated once. Prereq: SOC 101. *Staff.*

750 *Problems in Educational Sociology.* (3) S
An advanced course in the application of sociological findings to education, including consideration of Southern regional problems and potentialities. Prereq: 12 semester hours of graduate work including EDF 661 or equivalent; SOC 101. (Same as EDF 750.) *Staff.*

766 *Concepts in Medical Sociology.* (3) I
A systematic review of sociological concepts and methods which have been applied to the study of health and medicine; the contributions of medical sociology to general sociological theory; the roles of sociology in education for the health professions and in research on health related problems of society. Two class hours and four laboratory hours per week. Prereq: Predoctoral status in one of the Social or Behavioral Sciences with a concentration or minor in Medical Behavioral Science; SOC 101. (Same as BSC 766.)

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 18 wks. residence)
May be repeated indefinitely. *Staff.*

770 *Seminar in Sociological Theory.* (3) II
An intensive survey of contemporary general theorists from Comte to the present. The principal sociological concepts of each are considered and their role in the development of contemporary sociology is assessed. Prereq: SOC 101. *Drysdale.*

772 *Topical Seminar in Sociology.* (3) I, II, S
Advanced study of topics of current importance in sociology, such as structural strain and social change, game theory, decision processes, communication and power structures. Prereq: at least nine hours in the social sciences, preferably in sociology; SOC 101. May be repeated to a maximum of six credits. *Staff.*

773 *Topical Seminar.* (3)
Analysis of topics of scientific interest in rural sociology selected from such fields as criticism of research, sociological factors in land use, migration, rural social ecology of the South, and highland societies. May be repeated once for a maximum of six credits. Prereq: SOC 101.

775 *Seminar in the Family.* (3)
A seminar for students with a professional interest in the family. Selected topics are intensively examined. Prereq: SOC 101.

775 *Seminar in the Family.* (2)
A seminar for advanced students interested in family research, family counseling, or dealing with family relations in some other professional capacity. ***Gladden, Kenkel.***

779 *Seminar in Social Psychology.* (3) II
Each semester some topic in the field of social psychology, such as attitudes and beliefs, structure and function of social groups, social determinants of behavior, leadership, and morale will be studied intensively. (Same as PSY 779.) May be repeated to a maximum of six credits. Prereq: SOC 101. *Staff.*

780 *Special Problems in Sociology.* (1-6) I, II, S
May be repeated to a maximum of 10 credits. Prereq: SOC 101. *Staff.*

790 *Research in Rural Sociology.* (1-3)
Individual graduate research with correlated study of rural social research types and methods. May be repeated for a maximum of six credits. Prereq: SOC 101.

792 *Research in Sociology.* (1-6) I, II, S
Individual research and reading in particular fields of sociology, under staff supervision. Open to advanced students who are prepared for intensive study beyond that offered in regular classes in each field. May be repeated to a maximum of 10 credits. Prereq: SOC 101. *Staff.*

SPANISH AND ITALIAN LANGUAGES AND LITERATURES

The Department of Spanish and Italian offers the Master of Arts (in Spanish), and the Doctor of Philosophy (in Spanish) degrees.

General Prerequisites: Graduate Record Examination scores are required for admission. All entering degree candidates must be able to read, write, speak and understand English with a level of fluency sufficient to take courses in other departments.

Master of Arts Degree, Prerequisites: Attainment in Spanish equivalent to that required for the undergraduate major in Spanish at the University of Kentucky. *M.A. Requirements:* Standard Graduate School requirements except course work must include SPI 501 or equivalent, and reading knowledge of another language.

Doctor of Philosophy Degree, Requirements: 1) SPI 601-602, 621, and a minimum of two seminars in the department; 2) a reading knowledge of two foreign languages other than Spanish and English; 3) a minimum of three courses cognate to the field of special emphasis outside the area of Spanish;

4) successful completion of a series of four written examinations (plus a two hour oral); 5) presentation of an acceptable dissertation.

Remarks: All candidates for the Ph.D. degree are required to spend at least two consecutive semesters of full time residence beyond the M.A. degree (excluding summer sessions) in the department. Full time residence is defined as follows: 1) nine course hours (excluding SPI 782) for departmental assistants teaching six hours, 2) 12 course hours for fellowship holders. Experience has shown that doctoral candidates should plan to complete two years of full time course work (nine hours per semester) beyond the M.A. degree.

The department recognizes four areas of study: Spanish Medieval, Renaissance, Modern (18th, 19th, 20th Centuries), and Spanish American literature. All candidates for the doctorate are asked to declare one of the four as an area of special competence. The minimum three courses outside of Spanish should be cognate to this field of special emphasis; they need not be taken entirely in one department. The final written examinations are designed to test competence in four areas and are required of all candidates. The examination corresponding to the field of special emphasis is longer and more detailed than the other three.

ITALIAN

543 *Survey of Italian Literature I.* (3)
A survey of Italian literature from its beginning to the 17th century. Three class hours per week. Prereq: SPI 292 or SPI 009.

544 *Survey of Italian Literature II.* (3)
A survey of Italian literature from the 17th century to the present. Three class hours per week. Prereq: SPI 292 or SPI 009.

561 *Old Italian.* (3)
An intensive study of the Old Italian language and its derivation, with mention of the development of the more important dialects along with the modern language. Examinations and study of medieval texts. Three class hours per week. Prereq: Adequate reading knowledge of modern Italian.

563 *Dante I.* (3)
Dante, the *Vita Nuova* and the *Divina Commedia, Inferno.* Three class hours per week. Prereq: SPI 543 or 544, or consent of instructor.

564 *Dante II* (3)
Dante, the *Divina Commedia: Purgatorio and Paradiso.* Three class hours per week. Prereq: SPI 563.

565 *Petrarch and Boccaccio.* (3)
Study of the Italian works of Petrarch and Boccaccio. Three class hours per week. Prereq: SPI 543 or 544, or consent of instructor.

566 *Literature of the Italian Renaissance.* (3)
A study of the major literary trends and figures of the Italian Renaissance, from the literary and humanistic successors of Petrarch and Boccaccio to the writers of the Cinquecento. Three class hours per week. Prereq: SPI 543 or 544, or consent of instructor.

571 *Modern Italian Novel.* (3)
A study of the origins and development of the modern Italian novel, with emphasis on major nineteenth-century trends as represented by the works of Foscolo, Manzoni, Verga, Fogazzaro and D'Annunzio, and on Pirandello and selected contemporary novelists. Three class hours per week. Prereq: SPI 292 or the consent of the instructor.

572 *Modern Italian Drama.* (3)
A study of the origins and development of modern Italian drama, from Goldoni and Alfieri in the eighteenth century, through Verga and D'Annunzio to Pirandello, Betti, Sem Benelli and other contemporary dramatists. Three class hours per week. Prereq: SPI 292 or consent of instructor.

573 *Modern Italian Poetry.* (3)
A study of the development of modern Italian poetry, with emphasis on major figures and trends, and close reading of texts. Three class hours per week. Prereq: SPI 292 or consent of instructor.

591 *Dante in Translation.* (3)
A study of the works of Dante from the literary viewpoint. Emphasis given to his sources, his enormous impact upon subsequent Italian and European literatures. The Divine Comedy would be the focal point of the course, but the poet's lesser works would also be studied. Three class hours per week. Not open to graduate students in Italian.

592 *Italian Renaissance Masterpieces in Translation.* (3)
A study of the great authors of the Italian Renaissance and their works in English translation: Petrarch, Boccaccio, Poggio, Piccolomini, Bruni, Pontano and others. Three class hours per week. Not open to graduate students in Italian.

593 *Modern Italian Literature in Translation.* (3)
A study of the major trends and figures of 19th and 20th Century Italian literature. Three class hours per week.

SPANISH

501 *Survey of the Spanish Language.* (3) I, II, S
The development of the Spanish language from its Vulgar Latin stages to the modern period. Special emphasis on the Spanish of the 12th through the 14th centuries. Representative texts are analyzed. Three class hours per week. *Sturm.*

502 *Spanish Phonetics and Pronunciation.* (3) I, II, S
An introduction to the phonetic peculiarities of the Spanish language as it is spoken in the major cultural areas of the Hispanic world. Three class hours per week. Prereq: SPI 202. *Staff.*

503 *Masterpieces of Medieval Spanish Literature.* (3) I, II, S
A close reading and analysis of representative masterpieces from the Old Spanish Period, including the *Poema* of the Cid, the works of Gonzalo de Berceo, the *Libro de Buen Amor* and the Conde Lucanor. Three class hours per week. *Sturm.*

509 *Spanish Literature of the Seventeenth Century: Drama.* (3) I, II, S
A careful study of the important works of the great Spanish dramatists of the 17th Century—Lope de Vega, Calderon, Tirso de Molina and their contemporaries. Three class hours per week. Prereq: SPI 315, 316. *McCrary.*

510 *Spanish Literature of the Seventeenth Century: Non-Dramatic Literature.* (3) I, II, S
Representative masterpieces of the novel, poetry and theoretical writings of the 16th and 17th centuries. Three class hours per week. Prereq: SPI 315, 316. *J. Jones.*

515 *Masterpieces of Modern Spanish Poetry.* (3) I, II, S
A study of the most significant movements from the 18th Century to the present. Prereq: 315, 316. *Reedy.*

516 *Masterpieces of Modern Spanish Drama.* (3) I, II, S
A study of the most important plays of the Neoclassic, Romantic and Modern Theater. Prereq: 315, 316. *M. Jones.*

517 *Masterpieces of the Modern Novel.* (3) I, II, S
Representative novelists from the 18th Century to the contemporary period are analyzed, with special emphasis on the period of the realistic novel through the post-Civil War generation. Prereq: SPI 315, 316. *M. Jones.*

518 *Spanish Literature of the XX Century.* (3)
A study of the works of the Generation of 1898 and representative works of recent writers.

523 *Spanish American Prose Fiction.* (3) I, II, S
A study of the novel in Spanish America, with emphasis on the principal authors and works from Lizardi to the present. Prereq: SPI 315, 316 or 318, 319. *Reedy, Saenz.*

524 *Spanish American Essay.* (3) I, II, S
A comprehensive study of the principal currents of thought in the Spanish American essay with special attention to the *americanistas.* Prereq: SPI 315, 316 or 318, 319. *Saenz.*

525 *Spanish American Drama.* (3) I, II, S
A study of dramatic production in Spanish America from the missionary theatre to the present, accentuating the work of later authors beginning with Florencio Sanchez. Three class hours per week. Prereq: SPI 315, 316 or 318, 319. *Reedy, Saenz.*

526 *Spanish American Poetry.* (3) I, II, S
A study of Spanish American poetry, stressing the outstanding poets since Sor Juana. Prereq: SPI 315, 316 or 318, 319. *Reedy, Saenz.*

527 *Spanish American Short Story.* (3)
A study of the Spanish American short story from Echeverria to the present with particular emphasis on Dario, Quiroge, Lillo, and Borges. Prereq: SPI 319 or equivalent.

535, 536 *Advanced Spanish Grammar and Composition.* (3 ea) I, II, S
A study of the finer points of Spanish grammar. Prereq: SPI 210. Staff.

551 *Tutorial Seminar for Spanish Majors.* (1) I, II, S
Research in special topics of Spanish and Spanish American literature for majors during the senior year. May be repeated once for a total of two credits.

553 *The Teaching of Modern Foreign Languages.* (3) S
A course for teachers and prospective teachers.

601 *Old Spanish: Phonology and Paleography.* (3) I, S
Intensive study of phonology of Spanish with emphasis on the various linguistic backgrounds that developed it. Examination and study of medieval texts with exercises in paleographical transcription of medieval manuscripts. *Keller.*

602 *Old Spanish: Morphology and Syntax.* (3) II, S
An intensive study of the morphology and syntax of Spanish, with emphasis on the Latin and Vulgar Latin grammatical systems which were the background of Spanish. Further examination of medieval texts with exercises in paleographical transcription of medieval manuscripts. Prereq: SPI 601. *Keller.*

603 *Medieval Spanish Literature I.* (3)
A survey of Medieval Spanish Literature from the beginning to the end of the 13th Century. Three class hours per week. *Keller.*

604 *Medieval Spanish Literature II.* (3)
A survey of Medieval Spanish Literature of the fourteenth and fifteenth centuries. Three class hours per week. *Keller.*

605 *The Spanish and Spanish American Ballad.* (3) I, II, S
A study of the rise and development of the Spanish and Spanish American ballad from its origins to the present. Special emphasis on folkloristic and literary phases of the ballad, and comparison with the English ballad.

606 *Romance Philology.* (3)
A study of the historical development of the various Romance Languages with reading of texts chiefly from the medieval period. Special attention will be given to historical phonology and morphology. May be repeated once. Prereq: FR 603 or SPI 501 or equivalent.

607 *Early Brief Narrative—13th 14th, 15th Century.* (Alternate years) (3)
The rise and development of the brief narrative in prose and rise of the oriental apologue, hagiographical tales and Greco-Roman fables. Three class hours per week.

608 *Spanish Epic.* (Alternate years) (3)
Study of the Poem of the Cid and the important cycles of Spanish epicry with their sources, parallels in history and influences upon other genres. Three class hours per week.

609 *Spanish Poetry of the 13th, 14th, 15th Centuries.* (Alternate years) (3)
Development of lyric poetry from the earliest beginnings to the 15th century. The *harchas,* Galician-Portuguese, lyric, sacred lyric and the poets of the *concioneros,* exclusive of the ballad. Three class hours per week.

615 *The Spanish Novel to Cervantes.* (3)
The development of the novel from *El caballero Cifar* to *Guzman de Alfarache,* including masterpieces of chivalresque, sentimental, pastoral and picaresque prose.

616 *Cervantes.* (3) I, II, S
The works of Cervantes, with emphasis on *Don Quixote,* but including other works and major works of Cervantine criticism. Three class hours per week. *J. Jones.*

617 *The Spanish Novel from Cervantes to Romanticism.* (3)
The post-Cervantine novel, including works by Lope, Tirso, Quevedo, Gradian, Isla and lesser novelists and novella-writers of the 17th and 18th centuries.

618 *Mystic and Ascetic Writers of the 16th and 17th Centuries.* (3)
A survey of ascetic and mystic writers including among others: Juan de Avila, Luis de Leon, Luis de Granada, Santa Teresa, San Juan de la Cruz.

619 *Lope de Vega.* (3) I, II, S
The major dramatic and non-dramatic works of Lope de Vega. Three class hours per week. *McCrary.*

620 *The Theatre of Tirso de Molina.* (3) I, II, S
The major dramatic works of Tirso. Three class hours per week. *McCrary.*

621 *The Theatre of Calderon de la Barca.* (3) I, II, S
The dramatic works and techniques of Calderon. Three class hours per week. *McCrary.*

622 *Minor Dramatists of the Golden Age.* (3) I, II, S
The dramatic works of such playwrights as Guillen de Castro, Alarcon, Mira de Amescua and other contemporaries of Lope de Vega and Calderon. Three class hours per week. *McCrary.*

623 *Spanish Poetry of the 16th and 17th Centuries.* (3)
An examination of the several schools and forms of poetry, both lyric and narrative, in this period. Three class hours per week.

628 *Spanish Drama from the Neoclassic Period to the Generation of 1898.* (3) I, II, S

Representative dramatic trends of the 18th and 19th centuries. Three class hours per week. *M. Jones.*

629 *Spanish Drama from the Generation of 1898 to the Present.* (3) I, II, S

Representative works of the major dramatists and dramatic trends from Benavente and his contemporaries through Garcia Lorca, Casona and Buero Vallejo. Three class hours per week. *M. Jones.*

630 *Prose Fiction from the Romantic Period to the Generation of 1898.* (3) I, II, S

A study of the major schools of fiction from the Romantic Period through the Generation of 1898. Three class hours per week. *M. Jones.*

631 *Prose Fiction from the Generation of 1898 to the Present.* (3) I, II, S

Studies in the most important novels and short stories of the later part of the modern period, produced from 1930 to the present. Three class hours per week. *M. Jones.*

632 *The Spanish Essay from the 18th Century to the Present.* (3)

An examination of the intellectual preoccupations of Modern Spain as expressed in the essay from the 18th Century to the present.

633 *Spanish Poetry from the Eighteenth Century to the Present.* (3) I, II, S

A study of the major poetic schools from the 18th Century throughout the Civil War. Three class hours per week. *Reedy.*

641 *Spanish American Novel: Mexico, Central America, the Caribbean.* (3) I, II, S

The works of the principal novelists of Mexico, Central America and Caribbean with special emphasis on the novelists of the Mexican Revolution. Three class hours per week. *Saenz, Reedy.*

642 *Spanish American Novel: South America.* (3) I, II, S

Representative works of the principal authors of South America, with special emphasis on Peru, Argentina, Chile, Colombia and Venezuela. Three class hours per week. *Reedy, Saenz.*

643 *Spanish American Poetry Colonial Period to 1888.* (3)

Representative works of the principal poets from the Colonial Period through the Romantic Movement with emphasis on Sor Juana Ines de la Cruz and the Romantics. Three class hours per week. *Reedy, Saenz.*

644 *Spanish American Poetry: Modernism to the Present.* (3)

Representative works of the principal poets of the Modernist Period to the present. Three class hours per week. *Reedy, Saenz.*

645 *Literary Currents in Contemporary Spanish American Fiction.* (Every other year) (3)

An examination of the outstanding works of Spanish American authors during the past 10 years, with emphasis on literary innovations and new currents in the novel, short story, poetry and drama. Three class hours per week.

660 *Bibliography and Methods of Research.* (3) I, II, S
Investigation of Spanish bibliography and modern methods of research designed to provide guidance to the graduate student leading to an understanding of research methods and publication. Taught by various members of the staff, with each member dealing with his own specialty. Three class hours per week.

701 *Seminar in Historical Linguistics.* (3) I, II
Intensive study of specific problems in the medieval Spanish language. Three class hours per week. Prereq: SPI 601-602 or equivalent. *Keller.*

702 *Seminar in Medieval Spanish Literature.* (3) I, II
Special and intensive study of a single problem in medieval Spanish literature. Three class hours per week. Prereq: SPI 601-602 or equivalent. *Keller.*

703 *Seminar in Golden Age Non-Dramatic Literature.* (3) I, II
Special and intensive study of the work or works of a single Golden Age writer or of a movement in the non-dramatic literature of the Golden Age. Three class hours per week. Prereq: Two Spanish courses in 606 to 610 bracket. *McCrary, J. Jones.*

704 *Seminar in Golden Age Theater.* (3) I, II
Special and intensive study of a specific area of the Golden Age theatre. Prereq: SPI 611-614 (any two courses). Three class hours per week. *McCrary.*

705 *Seminar in Modern Spanish Literature.* (3) I, II, S
Seminar in the recent Premio Nadal novels and other post Civil War novelists. Three class hours per week. *Jones, Reedy, Saenz.*

706 *Seminar in Spanish American Literature.* (3) I, II, S
Special and intensive study of particular areas of Spanish American Literature. Three class hours per week. Prereq: SPI 512, 547, 624-627 (any two courses). *Reedy, Saenz.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

772 *Seminar in Spanish Literature.* (3) I, II, S
A seminar designed to provide intensive study of a literary, scholarly, or intellectual problem of Spanish letters not covered as such in any of the above listed offerings. Prereq: 21 semester hours of college Spanish.

778 *Seminar—Main Currents of Romance and German Literature.* (3)
Studies of the principal works of the French, German and Spanish literature. Lecture, student reports.

782 *Special Studies in Spanish.* (3) I, II, S
Selected studies and investigations in the Spanish language and literature, permitting the student to work in areas of special interest, and providing opportunity for original endeavor. May be repeated to a maximum of six credits. *Staff.*

STATISTICS

Recognizing the need to develop a coordinated program of teaching, research and consulting in statistics, the University of Kentucky established a Department of Statistics on July 1, 1967. This department joined the existing Departments of Mathematics and Computer Science to form the School of Mathematical Sciences. Graduate programs in Statistics leading to degrees of Master of Science, Master of Science in Statistics and Doctor of Philosophy were authorized in 1968. An interdepartmental program in Operations Research is under consideration.

Statistics applicants are expected to have a minimum of one year of calculus and at least a B average in previous mathematics and statistics courses. Students with an undergraduate major in an applied field, as well as majors in statistics or mathematics, are urged to apply. Since at least one semester each of advanced calculus and matrix algebra are required for the basic statistical inference courses, prospective graduate students who have not taken these courses as undergraduates are urged to take them in the summer prior to entrance in the graduate program.

MASTER'S PROGRAMS

The department offers the degree of Master of Science with a major in statistics with or without a thesis but requiring the reading knowledge of one modern foreign language (Plans A and B) and the degree of Master of Science in Statistics, which requires no thesis or language. All master's candidates are expected to complete the equivalent of STA 524, 531, 601, 602, 614 and 616 (20 semester hours). Additional course requirements depend on the student's interests. A student primarily interested in probability and mathematical statistics could select from such courses as STA 612, 624, 661 and 721, as well as graduate courses in mathematics. One primarily interested in applied statistics and data analysis could select from such courses as STA 641, 642 and 643, as well as courses in computer science and applied areas. Any combination of these courses would be accepted. There are no formal minor requirements. Departmental written examinations in basic statistical theory and analysis are required of all master's candidates.

DOCTORAL PROGRAMS

A Ph.D. student can major in either experimental or mathematical statistics and should complete the equivalent of the six required master's degree courses plus at least eight others and a course in real analysis (such as MA 572). These additional courses should include STA 701-702 plus at least six others as follows:

Majors in Experimental Statistics

(i) At least two from STA 641, 642 and 643
(ii) At least one from STA 612, 661 and 721
(iii) Select other advanced statistics courses or courses from the computer science or other departments

Majors in Mathematical Statistics

(i) Complex Variables (such as MA 433)
(ii) STA 624 and 661
(iii) At least one from STA 612 and 721
(iv) Advanced courses in the dissertation area, possibly including more mathematics

Qualifying examinations for the doctorate consist of the two basic examinations in statistical theory and analysis (if not completed satisfactorily for the master's degree) plus a common examination covering the content of STA 701-702 and a special examination in the major area. An oral qualifying examination also is required. A reading knowledge of one modern language is required of all Ph.D. Areas of dissertation research include Bayesian inference, categorical data analysis, distribution problems, experimental design construction, large sample theories, misclassification problems, multivariate analysis, non-linear models, non-parametric inference, prior information in regression models, response surface design and analysis, selection of predictors, stochastic models and variance component design and analysis.

STATISTICS COURSES

Courses numbered 400-499 do not carry graduate credit for students majoring in Statistics.

421 *Basic Statistical Theory I.* (3)
Discrete and continuous probability distributions; simple random sampling; point and interval estimation; hypothesis testing. Coreq: MA 214.

422 *Basic Statistical Theory II.* (3) II
Theory of least squares; regression; analysis of variance and covariance; experimental design models; factorial experiments; variance component models. Prereq: STA 421.

423 *Introductory Probability.* (3) I, II
Set theory; fundamental concepts of probability, including conditional and marginal probability; random variables and probability distributions (discrete and continuous); expected values and moments; moment generating and characteristic functions; random experiments; distributions of random variables and functions of random variables; limit theorems. Three class hours per week. (Same as MA 423.) Prereq: MA 214.

511 *Statistical Analysis.* (3) I
Procedures for collecting and summarizing population data; index numbers; measures of central tendency and dispersion; random sampling; empirical frequency distributions; point and interval estimators; control charts; hypothesis testing; goodness-of-fit; contingency tables; equality of means and variances; simple analysis of variance; multiple comparisons; simple regression and correlation. Three class hours per week. Prereq: STA 421 or 531.

524 *Discrete Probability.* (3)
Sample space, combinatorial methods, combination of events, laws of large numbers, normal approximation to the binomial; generating functions; convolutions; random walks; branching processes; recurrent events. Prereq: MA 432 or 471 or consent of instructor. (Same as MA 524.)

531 *Theory of Statistical Inference I.* (4)
Sample space, concept of probability, conditional probability, random variables, density and distribution functions, mathematical expectation; moment generating functions; functions of random variables; limit laws, usual distributions, certain derived distributions, introduction to estimation and hypothesis testing. Prereq: MA 432 or 471 or consent of instructor. (Same as MA 531.)

601 *Theory of Statistical Inference II.* (3)
Elements of decision theory; properties of estimators; point and interval estimation; hypothesis-testing; sequential testing; inference from categorical data; linear regression as conditional expectation; multivariate normal distribution. Prereq: STA 531.

602 *Theory of the General Linear Model.* (3)
Distribution of quadratic forms, linear estimable functions and their best estimates; principle of conditional error; testing linear hypothesis; multiple and polynomial regression; regression estimation using prior information; estimation of error variance; complete and incomplete block designs; factorial experiments; covariance; variance components; mixed models. Three class hours per week. Prereq: STA 531, MA 462.

612 *Selected Areas in Statistics.* (3)
Two or more of the following areas will be briefly surveyed; non-parametric and distribution-free methods; sequential analysis; Bayesian inference; multivariate analysis. Prereq: STA 531.

614 *Design and Analysis of Experiments.* (4) II
Multiple regression; curvilinear regression; experimental designs; randomized blocks and n-way classifications; Latin squares; hierarchial classifications; incomplete blocks and cross-overs; factorial and fractional factorial experiments; variance component estimation. Three class hours, two lab hours per week. Prereq: STA 422 or coreq: STA 602.

616 *Design and Analysis of Sample Surveys.* (3) II
Sampling from finite populations; estimation of sample size; stratification; ratio and regression estimators; systematic sampling; cluster sampling; multi-stage sampling (selection of sampling units with probability proportional to size); double sampling; response errors. Two class hours per week. Prereq: STA 421 or coreq: STA 531.

624 *Advanced Probability I.* (3)
Markov chains, birth and death processes, renewal theory, central limit theorem, stochastic processes. Prereq: STA 524 or 531; coreq: MA 433. (Same as MA 624.)

641 *Design and Analysis for Variance Component Models.* (3) I
Expected values; variances and covariances; balanced and non-balanced designs; comparison of estimators; reduction of product variability; compositing; sequential designs; Bayesian estimation; confidence limits; negative estimates; finite populations. Three class hours per week. Prereq: STA 602.

642 *Response Surface Techniques.* (3) II
Analysis in vicinity of stationary point; canonical analysis; steepest ascent for locating optima; first order designs for fitting response surfaces; orthogonal designs; second order designs; rotatability; central composite designs; conditions for orthogonal blocking; designs to minimize bias and mean square error; designs for sets of constrained variables. Three class hours per week. Prereq: STA 614.

643 *Advanced Experimental Design.* (3) I
Advanced topics in analyses of incomplete block designs; confounding and change-over designs; data collected at several places and times; principles of design construction. Three class hours per week. Prereq: STA 614.

652 *Advanced Mathematical Programming.* (3) II
A course for those desiring to study linear and non-linear programming from an advanced mathematical point of view. Theory of graphs; discrete linear programming; stochastic, non-linear and dynamic programming. Three class hours per week. Prereq: A course in linear programming.

661 *Multivariate Analysis I.* (3) I
Characterization and properties of the multivariate normal distribution, random samples from this distribution; multivariate analysis of variance, related distribution theory; factor analysis. Three class hours per week. Prereq: STA 601, 602.

670 *Basic Statistical Analysis.* (4)
Primarily in biological, behavioral and social sciences. Introduction to methods of analyzing data from experiments and surveys; the role of statistics in research, statistical concepts and models; probability and distribution functions; estimation; hypothesis testing; regression and correlation; analysis of single and multiple classification models; analysis of categorical data. Three class hours and two laboratory hours per week. Prereq: Previous statistical experience or consent of instructor.

674 *Statistical Analysis and Experimental Design.* (3)
Multiple comparisons; individual degress of freedom; multiple regression; covariance; methods of constructing designs for experimental investigations; concepts of blocking, randomization and replication; experimental unit technique; complete and incomplete block designs; response surface methodology. Three class hours per week. Prereq: STA 670.

676 *Statistical Analysis and Survey Design.* (3)
Multiple regression; covariance; non-parametric methods; model construction; methods of constructing designs for survey investigation; simple random, stratified and multistage sampling designs; methods of estimation; questionnaire construction. Three class hours per week. Prereq: STA 670.

678 *Statistical Genetics.* (3)
Statistical approaches to the analysis of quantitative inheritance; definition and estimation of genetic parameters relating to selection; inbreeding theory; random-mating and inbred populations; testing and planning in genetic experiments. Three class hours per week. (Same as AGR 678 and BIO 678.) Prereq: STA 674 and BIO 620 or consent of instructor.

681 *Statistical Techniques for Engineers and Physical Scientists.* (3)
Primarily in the engineering and physical sciences. Random variables; distribution functions; hypothesis testing; simple and multiple regression; transformations; estimation of functional relationships from experimental data; full, fractional, and central composite designs.

690 *Seminar in Statistics.* (1)
May be taken a maximum of two times.

691 *Special Topics in the Planning and Analysis of Experiments.* (3) I, II
Place of statistics in experimentation; topics in experimental design; response surfaces; departures from usual assumptions in analysis of variance; other selected topics. Three class hours per week. Prereq: STA 422 or STA 602 or 674.

695 *Special Topics in Statistical Theory.* (3)
To be selected by staff. Three class hours per week. Prereq: STA 601.

701 *Advanced Theory of Statistical Estimation.* (3)
General decision theory approach to estimation, method of maximum likelihood, BAN estimates, Cramer-Rao inequality and its extensions, sequential estimation, sufficiency and completeness in unbiased estimation, unbiased and minimax prediction, estimation by confidence sets, Stein's two-stage procedure. Prereq: STA 601. Coreq: MA 572 or equivalent.

702 *Advanced Theory of Hypothesis Testing.* (3)
Review of basic concepts of measure and integration; sufficiency and exponential family of distributions; most powerful and uniformly most powerful tests; likelihood ratio test procedures; sequential testing; unbiased and similar tests; permutation and invariant tests. Prereq: STA 701.

703 *Advanced Probability II.* (3)
Review of probability spaces; general stochastic processes; spectral analysis of stationary random processes; infinitely divisible distributions; theory of queues. Prereq: MA/STA 624; Coreq: MA 572. (Same as MA 703.)

721 *Non-Parametric Inference.* (3) I
Estimation and testing when the functional form of the population distribution is unknown; rank and sign tests; tests based on permutations of observations; power of non-parametric tests; optimum non-parametric tests and estimators. Three class hours per week. Prereq: STA 601; Coreq: MA 572.

722 *Topics in Nonparametric Inference.* (3)
Order statistics, estimation of density function, rank orders, rank order tests, sequential nonparametric procedures, asymptotic normality and efficiency. Prereq: STA 721.

762 *Multivariate Analysis II.* (3) II
A more rigorous study of distribution theory than in STA 661; random and mixed effects models; multivariate non-normal analysis. Assorted other topics. Three class hours per week. Prereq: STA 661.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.

THEATRE ARTS

The Department of Theatre Arts requires for the Master's Degree a minimum of 30 semester hours of Theatre Arts and English dramatic literature courses including English 600 *Bibliographical Studies*. A maximum of 6 of these 30 semester hours may be taken in other allied subjects provided these courses have the approval of the Chairman of the Department of Theatre Arts. All candidates for the Master's Degree in Theatre Arts will be required to attain a reading knowledge of one modern foreign language (ordinarily French or German) before receiving the degree.

It is assumed that a student who seeks a Master's Degree in the Department of Theatre Arts will have had courses approximating those required for an A.B. degree with a major in Theatre Arts. If not, he must remove the deficiency by taking (without graduate credit) courses in addition to those normally specified for the Master's Degree.

The Department offers the Master's Degree according to Plan B only at the present time (see page 23).

590 *History of the Theatre I.* (3)
A study of the theatre from primitive times through the Elizabethan period. Theatre and stage architecture, scene design, costuming and acting styles are discussed and their relation to dramatic literature analyzed.

591 *History of the Theatre II.* (3)
A continuation of TA 590, a study of the theatre from the Jacobean period to the present.

592 *Scene Design I.* (3)
Study of theory, principles and techniques of scene and lighting design for the contemporary theatre. Comprehensive analysis of a play and the development of a design through the media of floor plans, lighting plot, and perspective line drawings. Prereq: TA 292 or 293 or consent of instructor.

593 *Scene Design II.* (3)
Intensified and expanded application of TA 592. Advanced theory and practice in scene and lighting design for the theatre. Prereq: TA 592 or consent of instructor.

594 *Acting I.* (3)
Study of acting styles from antiquity to the present, with emphasis on important acting periods. Lecture and weekly demonstrations for the development of skill in the use of body and for projection of voice and total characterization. Two hours of lecture and two hours of laboratory weekly. Prereq: Major or consent of instructor.

595 *Acting II.* (3)
Study and acting of scenes from classical and modern dramatic literature. Intensive application of techniques studied in TA 594. Two hours of lecture and two hours of laboratory weekly. Prereq: TA 594 or consent of instructor.

596 *Playwriting.* (3)
A course designed for students interested in creative drama. The completion of at least one play is required. May be repeated once for a total of six credits.

597 Teaching of Theatre Arts. (3)
A course designed to introduce teachers and community theatre workers to the problems of staging under circumscribed conditions; minimum essentials of play production and the means of supplying these needs. Required of all certification students.

598 Theatre Directing I. (3)
Study of movement, interpretation of lines, creation of atmosphere, use of stage areas, use of levels, methods of achieving a climax, handling of groups, planning of mob scenes. Prereq: Major or consent of instructor.

599 *Theatre Directing II.* (3)
Analyses and direction of the characteristics of tragedy, comedy, melodrama, farce and their variants. Intensive application of techniques studied in TA 598. Prereq: TA 598 or consent of instructor.

690 *Studies in Technical Theatre: Production* (3)
Problems in advanced sceno-graphic techniques including drafting for the theatre, period composition and design, translation of the design into actuality, planning and laying out the technical schedule. Prereq: Consent of instructor.

691 *Studies in Technical Theatre: Lighting.* (3)
Investigation and critical evaluation of lighting practice and artistry in the contemporary theatre. Prereq: Consent of instructor.

694 *Advanced Styles of Acting.* (3)
The rehearsal and performance of scenes and class exercises in improvisation to develop creative imagination as a basis for acting. May be repeated once for a total of six credits. Three class hours, two laboratory hours per week. Prereq: Graduate standing.

794 *Special Topics in Theatre Arts.* (3)
Study and research on specific topics and problems according to the interests and needs of individual students. Normally offered as an independent work course. (May be repeated once for a total of six credits.)

798 *Directing.* (3)
Seminar and research in the aesthetics and techniques required for the production of period classics of dramatic literature. May be repeated once for a total of six credits. Three class hours, two laboratory hours per week.

ZOOLOGY

For description of program, see p. 75.

III. BUSINESS AND ECONOMICS

THE DEGREE OF MASTER OF SCIENCE IN ACCOUNTING

Objectives

The principal objectives of the Master of Science Program in Accounting are to develop the ability to perform, and report upon, significant research and to further the understanding of the relationship between accounting and other disciplines. Since the specific needs of individuals for advanced study differ, the program has been structured to provide maximum flexibility.

Requirements

1. Admission to the advanced degree program is open to students who hold a bachelor's degree from any accredited college or university, with an undergraduate grade point average of 2.7 or above and at least 450 on the Admission Test for Graduate Study in Business. If grade point average is between 2.4 and 2.7, the Admission Test for Graduate Study in Business must be 490 or above.

2. Graduate study in accounting presumes a minimal preparation in economics and business, including the following areas (undergraduate credit can be applied). In certain cases, these areas may be satisfied within the M.S. program upon approval of the Director of Graduate Studies:

   Principles of Economics (6 hours)
   Principles of Accounting (6 hours)
   Statistical Method (6 hours)
   Business Finance (3 hours)
   Marketing (3 hours)
   Management (3 hours)

   Additional minimal preparation is one course each in intermediate accounting, cost accounting, and income taxation.

3. A minimum of 30 semester hours must be presented in courses carrying graduate credit. At least 18 semester hours must be in courses reserved exclusively for graduate students and at least 12 of these must be in accounting.

4. The course requirements are:
   a. One course in each of the following fields:
      Advanced Managerial Accounting
      Income Taxation
      Attest Function
      Accounting Theory
   b. At least six semester hours of graduate credit outside the Department of Accounting, three of which must be in Economics.
   c. A course in Computer Science or Data Processing.

5. The candidate must submit evidence of competence in statistics, as follows: six hours of minimal preparation in statistics, and three hours in an approved statistics course numbered 400 or higher.
6. Successful completion of a comprehensive examination.

THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION

1. Admission to this program is open to students who hold a bachelor's degree from any accredited college or university, with an undergraduate grade point average of 2.7 or above and 450 or above on the Admission Test for Graduate Study in Business. If grade point average is between 2.4 and 2.7, the Admission Test for Graduate Study in Business must be 490 or above.
2. Graduate study in business presumes a minimal preparation in economics and business, including the following areas (undergraduate credit can be applied). In certain cases, these areas may be satisfied within the M.B.A. program upon approval of the Director of Graduate Studies:

Principles of Economics (6 hours)
Principles of Accounting (6 hours)
Statistical Method (6 hours)
Business Finance (3 hours)
Marketing (3 hours)
Management (3 hours)

BA 635—Managerial Economics	3 hours
BA 636—Research and Report Writing	3 hours
ACC 628—Accounting for Control and Planning	3 hours
BA 637—Administrative Behavior	3 hours
BA 645—Corporate Financial Policy	3 hours
BA 630—Advanced Marketing Management	3 hours
BA 639—Advanced Business Management	3 hours
One of the following:	
BA 652—Production Management	3 hours
BA 650—Quantitative Methods in Business Decisions	3 hours
Electives: Six hours of courses giving graduate credit	6 hours
TOTAL	30 hours

Master of Business Administration with Area Specialization: Six-hour sequences of courses may be approved for specialization beyond the core in the following fields: Marketing, Finance, Management Science, Managerial Accounting, Managerial Economics, and International Business.

Additional requirements are:

(a) Residence for at least two semesters at the University of Kentucky as a full-time student, or its equivalent as a part-time student.
(b) Minimal average of Grade B in all courses attempted for graduate credit.
(c) Successful completion of a comprehensive final examination.

THE DEGREE OF DOCTOR OF BUSINESS ADMINISTRATION

The basic purpose of the program leading to the Doctor of Business Administration degree is to enable persons who are seeking careers in collegiate business teaching, business research, or busines consultation in acquiring a comprehensive, professional education appropriate to their goals.

Objectives:

The Doctor of Business Administration degree is designed for persons who are seeking careers in collegiate teaching, business research, or business consultation. A basic purpose of the program is to develop a broad understanding of business administration, economic analysis, and related behavioral and quantitative disciplines. An appreciation of the administrator's point of view in decision making within an organzational setting, and the development of scientific methods and techniques in research investigations will be emphasized.

Requirements:

1. Background Training in Business and Business Related Areas.

   The D.B.A. is designed to provide specialization beyond the master's level. The educational background of each candidate will be reviewed by an admissions committee which will identify any deficiencies. In most cases, an M.B.A. from an accredited institution (A.A.C.S.B. accreditation) provides the background.

   Applicants with previous graduate credits are evaluated generally according to the following rules, but each case is individually examined. A minimal grade point average of 3.2 is required on all previous graduate credits. Also, students without ATGSB scores must take these exams before admission, with minimal score of 500.

2. Core Requirements (24 credit hours)

   a. Six hours of coursework in administrative science and management science

      BA 735, Administrative Science I
      BA 736, Administrative Science II

   b. Six hours of coursework in research

      BA 762, Research Methodology
      A graduate course in research techniques appropriate to major interest

   c. Six hours of coursework selected from:

      ECO 660, Advanced Microeconomic Theory
      ECO 661, Advanced Macroeconomic Theory
      A graduate course directly supporting major research interest

   d. Six hours of coursework in quantitative analysis

      BA 650, Quantitative Methods in Business Decisions
      BA 750, Statistics in Business Decisions

3. Major and Minor Field Requirements

The major field will consist of at least nine hours of graduate credit coursework from the following fields:

Accounting*
Finance
Human Resource Development
International Business
Management and Organizational Behavior*
Managerial Economics*
Marketing*

* Fields available, September 1970.

The minor field will consist of at least six hours of graduate credit coursework from the above fields or from an outside department closely related to the major field. This coursework must be approved by the Graduate Coordinator of the Department of Business Administration.

4. No foreign language is required.
5. Written comprehensive examinations are required in the major and minor fields.
6. The dissertation will be based on original research on a significant topic. The dissertation will be defended in an oral examination.

THE DEGREE OF MASTER OF SCIENCE IN ECONOMICS

The M.S. in Economics is primarily for students who wish to have flexibility in a program of advanced study in economics. The M.S. in Economics provides adequate preparation for initial employment as a teacher in colleges and as a researcher for government, business, and other organizations. The program can be structured to prepare a student for further graduate work in economics and related fields.

Recommended minimal undergraduate preparation—six hours of intermediate theory, six hours of statistics, and college algebra-trigonometry. These can be taken in the program as additional work.

Requirements for the M.S. in Economics are:

1. A minimum of 30 hours of graduate credit courses.
   a. Fifteen hours must be in courses in the Department of Economics, and 12 of these hours must be in courses reserved exclusively for graduate students.
   b. At least 15 hours of the total of 30 must be in courses reserved exclusively for graduate students.
   c. The 30 hours must include ECO 660 and 661—Economic Theory, and ECO 662—Research.
2. Successful examination in one modern foreign language or competence in mathematical sciences evidenced by nine hours of approved course work.

3. Success in a final examination.
4. Minimal average of Grade B in all courses attempted for graduate credit.

THE DEGREE OF MASTER OF ARTS IN ECONOMICS

The M.A. in Economics is the first stage of the Ph.D. program. As a terminal degree, the M.A. in Economics provides adequate preparation for initial employment as a teacher in colleges and as a researcher for government, business, and other organizations. The program is therefore designed to provide advanced study in:

1. Economic theory
2. Quantitative techniques, particularly statistics and mathematics
3. A specialization within economics, normally to consist of at least two courses
4. Research and writing skills

Recommended minimal undergraduate preparation—six hours of intermediate theory, six hours of statistics, and six hours of college mathematics. Students with bachelor's degrees outside of economics and business are encouraged to pursue the M.S. in Economics program.

Requirements for the M.A. in Economics are:

1. A minimum of 30 hours of graduate credit courses.
   a. At least 24 of the 30 hours must be in courses reserved exclusively for graduate students.
   b. ECO 590—Mathematical Economics (or its equivalent), ECO 660 and 661—Economic Theory.
   c. ECO 665—History of Economic Thought, or ECO 667—Economic History.
   d. One of the basic courses (600 level) in each of two of the elective fields from the Ph.D. program.
   e. ECO 662—Research.
2. Successful examination in one modern foreign language *or* competence in mathematical sciences, evidenced by nine hours of approved course work, six hours of which must be in statistics courses numbered 400 or higher.
3. Success in a final examination.
4. Minimal average of Grade B in all courses attempted for graduate credit.

THE DEGREE OF PH.D. IN ECONOMICS

Work for the degree of Doctor of Philosophy in Economics must conform to the general requirements of the Graduate School appearing on pages 24-29 in the *Graduate Bulletin*.

Objectives:

The Ph.D. in economics program is designed to give students both broad and intensive training in economics, research and communicative skills, and knowledge of the broad social, political, and economic environment.

Requirements:

Although there is no specific course work required in the Ph.D., the student must develop a depth of understanding in the following areas and the equivalent of the material in the following courses:

1. Economic Theory

ECO 590	ECO 760
ECO 660	ECO 761
ECO 661	

2. History of Economic Thought—Economic History
   a. History of Economic Thought—ECO 665 and 666.
   b. Economic History—667.

3. The Elective Requirement
   All Ph.D. students must complete two fields in economics in addition to 1 and 2 above. A sequence of two courses covers the minimum material necessary for each field.
   a. International Economics (ECO 671 and 771)
   b. Economic Development (ECO 673 and 773)
   c. Labor Economics (ECO 676 and 776)
   d. Public Finance (ECO 679 and 779)
   e. Regional Economics (ECO 682 and 683)
   f. Monetary Economics (ECO 686 and 786)
   g. Mathematical Economics (ECO 688 and 788)
   h. Econometrics (ECO 692 and 792)

4. Supporting Work—At least six hours of supporting coursework must be selected. These courses of study must be approved by the student's Special Committee.

5. Competence in mathematical sciences, evidenced by nine hours of approved course work, six hours of which must be in statistics courses numbered 400 or higher.

6. Successful examination in one modern foreign language.

7. Qualifying Examinations
   a. Written examinations: Written examinations must be taken in each of four fields (Economic Theory, Economic History and History of Economic Thought, two electives [from above eight]), as part of the requirement for candidacy for the Ph.D. These examinations usually are given in the spring and fall.

b. Oral examination for candidacy: After passing the above written examinations, the student will prepare a proposal for his dissertation. An oral examination will be held in which the prospective candidate must defend his proposal and demonstrate competence in his fields.

8. The Dissertation—The dissertation will be based on original research on a significant topic. The dissertation will be defended in an oral examination.

ACCOUNTING

401 *Accounting Theory.* (3)
An investigation into earlier attempts to develop a coordinated statement of accounting theory; a critical examination of selected current accounting practices; and discussion of recent developments in accounting research. Prereq: ACC 302.

408 *Cost Accounting.* (3)
Concepts of costs in developing information for management use in the determination of income, the selections of activities (or projects) and the measurement of performance. Prereq: ACC 202.

410 *Accounting for Institutions and Regulated Industries.* (3)
The requirements of adequate accounting systems for various governmental units, including the recording of usual transactions and the form and content of reports. Prereq: ACC 202.

414 *Data Processing in Accounting Systems.* (3)
Fundamentals of data processing for business organizations, including manual and automated applications, with emphasis on unit records, flow charts, and control procedures, in relation to both financial and non-financial data. Prereq: ACC 202.

416 *Accounting for Business Combinations.* (3)
Accounting records for consolidations and mergers, preparation of consolidated statements. Insolvency and receivership records and statements. Accounting for estates and trusts. Prereq: ACC 302 and senior standing.

417 *Income Taxation.* (3)
A comprehensive study of the federal income tax structure with emphasis on its application to individuals. Prereq: ACC 302 and senior standing.

418 *Controllership.* (3)
The organizational position of the controller, his functions and objectives, his methods and procedures.

419 *Internship in Accounting.* (3)
Students are placed with cooperating firms for on-the-job training in accounting. Written reports to be submitted by the firm and the student to the instructor. Prereq: ACC 302 and consent of instructor.

422 *Functions of Accounting.* (3)
Introduction to the basic concepts and uses of accounting data. Three class hours per week. Prereq: Consent of instructor. Not open to students who have ACC 202 or its equivalent.

503 *Auditing.* (3)
The attest function of accounting with both internal and independent application. Emphasis is placed on the ethics, standards, and objectives of auditing and management's responsibilities in implementing internal control. Prereq: ACC 302 and senior standing.

514 *Data Processing in Accounting Systems.* (3)
Fundamentals of data processing for business organizations, including manual and automated applications, with emphasis on unit records, flow charts, and control procedures, in relation to both financial and nonfinancial data. Prereq: ACC 202.

515 *C.P.A. Problems.* (3)
The application of generally accepted principles to representative problems from C.P.A. examinations. Prereq: ACC 302 and senior standing.

517 *Tax Accounting Problems.* (3)
A comprehensive study of corporation, partnership and fiduciary income tax problems. Consideration given to gift and estate taxes. Prereq: ACC 417 or consent of instructor.

524 *Analysis of Accounting Systems.* (3)
A study of the techniques and methods available to measure and evaluate the response of sub-systems to stimuli within the total systems concept. Both the analytical and computer simulation approaches are used to displace uncertainty associated with typical business problems in which the data are generated by the accounting system. Prereq: ACC 202; ECO 391.

601 *Research in Accounting Theory.* (3)
Critical examination of accounting concepts and standards. Study of current problems and contemporary developments reflected in accounting literature and reports. Prereq: ACC 302 or consent of instructor.

603 *Attest Function.* (3)
A critical examination of contemporary professional attestation theory and practice including a comprehensive review of AICPA audit case studies, statements on audit procedure, and their application in simulated business situations. Prereq: ACC 503 or consent of instructor.

608 *Advanced Managerial Accounting.* (3)
Accounting procedures for the evaluation of performance in business, including the analysis of revenues and costs by projects and responsibilities and the use of budget cost studies and rates of return. Three class hours per week. Prereq: ACC 408.

615 *Advanced Professional Problems.* (3)
The application of generally accepted principles to advanced problems of a professional level, including an analysis and study in depth of problems from professional examinations. Prereq: Consent of instructor.

617 *Income Tax Development.* (3)
A theoretical and historical approach to the study of federal income taxation with emphasis upon the public finance, legal, and accounting aspects of its development. Consideration will be given to tax research and planning as well as to the critical appraisal of the current law and proposals for its revision. Prereq: ACC 417 or consent of instructor.

619 *Independent Study in Accounting.* (1-3)
Designed for students undertaking special studies to be conducted in regular consultation with the instructor. Prereq: Consent of instructor.

628 *Accounting for Control and Planning.* (3)
A study of the application of accounting information and services in the recognition or solution of management problems in business. Prereq: ACC 202 or equivalent.

701 *Seminar in Accounting.* (3)
A study of accounting history and contemporary problems. Prereq: Consent of instructor.

795 *Independent Study (or Work) in Accounting.* (1-6)
Designed for students undertaking special studies to be conducted in regular consultation with the instructor. Class hours by appointment. Prereq: Consent of instructor.

BUSINESS ADMINISTRATION

MARKETING

430 *Marketing Distribution Systems.* (3)
The design and management of complex marketing organizations and systems, including home-office marketing organizations, field sales forces, channel structures, and the logistics of microdistribution systems. Three class hours per week. Prereq: BA 330.

431 *Contemporary Marketing Problems.* (3)
A capstone course with emphasis on the contemporary problems in the field of marketing. Consideration will also be given to the development of marketing programs including the integration of product planning, marketing communications, and marketing systems. Prereq: BA 330 plus 2 other marketing courses.

434 *Market Research.* (3)
Training in the application of scientific method to research in the fields of marketing. A major marketing investigation will be conducted by the class. Prereq: ECO 391 or equivalent.

630 *Advanced Marketing Management.* (3)
A critical study of significant trends, controversial issues and advanced techniques in the fields of marketing. Prereq: A course in marketing or consent of instructor.

656 *International Marketing.* (3)
A comparative approach to marketing systems with emphasis on the adaptability of U. S. marketing policies in overseas areas. The nature of the foreign markets, their growth, distribution systems and government policies. The U. S. firm and its overseas activities, organization structure, management, finance, product policies, physical distribution, promotion and research. Three class hours per week. Prereq: Consent of the instructor.

730 *Seminar in Marketing Theory.* (3)
A survey, analysis and evaluation of the current research in marketing theory. Detailed attention is given to problems of determining the meaning and boundaries of marketing theory. Emphasis is placed on introducing the student to the substantive content of marketing theories and their methodologies. Three class hours per week. Prereq: BA 630 or consent of instructor.

MANAGEMENT

435 *Analysis of Organizational Behavior.* (3)
The behavior of business organizations and their participants is analyzed in the contemporary language of social psychology, systems, and models. Various theories of the firm are reviewed and evaluated. The interdependence of economic, social and behavioral factors is stressed. Three class hours per week. Prereq: BA 335 or consent of the instructor.

439 *Business Policy.* (3)
Analysis of management problems, formulation of alternative courses of action, determination of policy decisions. Prereq: Senior standing, BA 435 or BA 450 or consent of the instructor.

536 *Applied Personnel Management.* (3)
Analysis of the problems, theories, and techniques used in recruitment, job analysis, selection decisions, interviewing, performance evaluation, and training in organizations. Prereq: BA 335, ECO 391, or consent of instructor.

537 *Contemporary Problems in Industrial Relations.* (3)
An examination of selected areas in the field of industrial relations with a focus on contemporary problems. Emphasis will be placed on individual work by the students. Prereq: BA 536 and ECO 578 or consent of instructor.

635 *Managerial Economics.* (3)
Analysis of applications of economic theory to management decision-making. Such problems as demand and cost determination, pricing, and capital budgeting are treated.

636 *Research and Report Writing.* (3)
An introduction to business research and formal report writing. Emphasis is placed on methodology, research design, techniques of analysis, and data sources. The actual writing of research reports is stressed.

637 *Administrative Behavior.* (3)
A critical examination of the principles, methods, policies and procedures related to the effective utilization of human resources in business concerns, consideration being given to mutual relationships.

638 *Comparative International Management.* (3)
A comparison of management concepts and practices in different countries and the role of management in economic development; an interdisciplinary approach emphasizing the impact of sociological-cultural factors, legal-political factors and education on management development. Three class hours per week. Prereq: BA 335 or consent of instructor.

639 *Advanced Business Management.* (3)
A functional study of business management. Control devices and procedures for carrying out and testing policies.

735 *Administrative Science I.* (3)
Primary emphasis upon the identification and investigation of the schools of thought concerning the field of administration. Analysis of various theory bases for purposes of integration and generalization will also make up a major portion of the course. Prereq: BA 335 or consent of instructor.

736 *Administrative Science II.* (3)
Examination and empirical research on organizational behavior, structure and dynamics. Integration of research and theory and development of modified theoretical approaches. Design of research to test some of the theory. Prereq: BA 735.

761 *Seminar in Managerial Economics.* (3)
Each semester some topic in managerial economics such as cost analysis, capital budgeting, production management, demand analysis, forecasting will be studied intensively Prereq: BA 635.

762 *Research Methodology.* (3)
This course will deal with the philosophy of science, problems of scientific logic, induction and deduction and the role of theory construction in the behavioral and social sciences. It will emphasize the nature of scientific method and problems in research design.

763 *Research, Design and Analysis.* (3)
This course deals with the design and analysis of business research. Emphasizes the practical application of analysis of variance and correlational techniques to problems in business research. Focus will be on design, implementation and interpretation of research. Prereq: BA 762.

LEGAL ENVIRONMENT

441 *Business Law II.* (3)
A continuation of BA 341. Prereq: BA 341 or consent of instructor.

FINANCE

446 *Investments.* (3)
Analysis of corporation statements for investment purposes; the security market; market influences on security prices; effect of interest changes on security prices; and the development of investment programs. Prereq: ACC 202.

447 *Life Insurance.* (3)
Economics of life insurance; organization and control; special forms of life insurance; and fundamental principles of rate-making. Prereq: ECO 261.

448 *Property and Casualty Insurance.* (3)
Public control; nature of contracts; analysis of reserve functions and rate-making processes. **Prereq: ECO 261.**

585 *Bank Management.* (3)
A study of principles and cases in commercial banking practice. Bank management practices are studied within the economic, monetary, fiscal and legal framework of the American economy. **Prereq: ECO 485 or consent of instructor.**

645 *Corporate Financial Policy.* (3)
A study of financial management from the viewpoint of the corporate financial officer. Problems of planning the capital structure, issuing securities, the management of working capital and policies with reference to reserves, surplus and dividends. Prereq: A course in business finance or consent of instructor.

646 *Investment Management.* (3)
Evaluation of sources of information and advice concerning securities, methods of analysis and policies of individuals and institutions in the management of investment funds. Prereq: Appropriate undergraduate courses in accounting and finance.

QUANTITATIVE BUSINESS ANALYSIS AND PRODUCTION

450 *Quantitative Analysis in Management.* (3)
An introduction to quantitative techniques in management decisions. Includes basic linear programming, Monte Carlo, and waiting line theory. Prereq: BA 335 and ECO 391 or consent of the instructor.

573 *Automatic Data Processing.* (3)
Examination of the role of high speed data processing equipment in the solution of business and economic problems. The study of computer fundamentals; input, arithmetic and logical units, control storage, and output. Includes digital computer programming. **Prereq: Junior standing.**

650 *Quantitative Methods in Business Decisions.* (3)
Application of mathematical analysis in business decision-making. Includes linear programming, total value analysis, incremental analysis, and other phases of operations research. **Prereq: MA 211 and ECO 291.**

652 *Production Management.* (3)
A study of procedures and techniques employed in manufacturing plants. An analysis of actual cases in production planning and control, time and motion study, quality control, plant layout, and budgetary control. Visits to industrial plants.

750 *Statistics in Business Decisions.* (3)
Statistical analysis as applied to business decisions. Includes waiting line theory, Monte Carlo method, and sampling as applied to inventory control, quality control, and similar business problems. **Prereq: ECO 291.**

INTERNATIONAL BUSINESS

456 *World Business.* (3)
Examines the impact of international business upon society from a political, cultural, and economic point of view. Particular stress will be given to U.S. business in international operations; its past involvement, present position, and future direction. Prereq: ECO 260, 261.

556 *International Commercial Policy.* (3)
America's position in the world economy and its international accounts; United States tariff policies, war debts, financial cooperation and investment policy. Prereq: ECO 471. (Same as ECO 571.)

ADDITIONAL COURSES IN BUSINESS ADMINISTRATION

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of 6 credits equivalence.

769 *Residence Credit for Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely.

771 *Seminar in Business Administration.* (3)

Each semester some topic currently discussed in scholarly journals in business administration will be studied intensively. Three class hours per week. May be repeated to a maximum of 9 credits. Prereq: Consent of instructor.

781 *Independent Work in Business Administration.* (1 to 6)

Designed for advanced students who undertake research problems to be conducted in regular consultation with the instructor. May be repeated to a total of 6 credits. Prereq: Consent of instructor.

ECONOMICS

ECONOMIC THEORY

460 *Analysis of Business Conditions.* (3)

A study of economic factors causing fluctuations in aggregate economic activity and the methods of forecasting business activity. Prereq: ECO 360 and 391 or equivalent.

464 *Topics in Economic Analysis.* (3)

An advanced undergraduate seminar in economic theory, including micro and macro. Each semester one or two topics will be selected for intensive study. May be repeated twice for a maximum of six credits. Prereq: ECO 360 and 361, and senior level standing.

660 *Advanced Microeconomic Theory.* (3)

An intensive course covering microeconomic theory and its various methodological and analytical techniques. Prereq: ECO 361 or consent of instructor.

661 *Advanced Macroeconomic Theory.* (3)

National income and employment theory, theories of inflation, and problems of economic growth. Prereq: ECO 360 or consent of instructor.

662 *Research Methods and Procedures in Economics.* (3)

The basic procedures and methods of research in economics are considered from the standpoint of their applicability to problem solving and discovery of new scientific facts and generalizations in economics. Definition of the problem, statement of hypothesis, research design, data collection methods and data analysis constitute the major topics. Attention is given to proper style and preparation of research reports in economics. Prereq: Second semester standing as graduate student in economics.

760 *Seminar in Microeconomic Theory.* (3)

Recent developments and major issues in contemporary microeconomic theory. Prereq: ECO 660 or consent of instructor.

761 *Seminar in Macroeconomic Theory.* (3)

Recent developments and major issues in contemporary macroeconomic theory. Prereq: ECO 661 or consent of instructor.

ECONOMIC HISTORY AND HISTORY OF ECONOMIC THOUGHT

467 *The Economic Evolution of the North Atlantic Community.* (3)
The related development of the European and American economies will be examined within the general framework of economic theory. Major emphasis will be given to the long-run process of economic growth with the period of analysis being from the 16th to the beginning of the 19th century. Prereq: ECO 260 and 261.

665 *History of Economic Thought I.* (3)
The background and development of English political economy up to 1848.

666 *History of Economic Thought II.* (3)
Main lines of controversy, reconstruction and development in economics since 1848 with emphasis on the bibliography.

667 *Seminar in Historical Studies in Economic Change.* (3)
Growth and development hypotheses will be tested on a wide range of historical materials drawn from the experience of Western Europe and America as bases for comparative studies in the newer developing regions.

668 *American Economic Change in Historical Perspective.* (3)
A wide range of statistical and historical studies will be used as bases to test various hypotheses concerning economic growth and development in the United States since the Revolution. Prereq: ECO 360, 361, or consent of instructor.

INTERNATIONAL ECONOMICS

471 *International Economics.* (3)
An analysis of the determinants of the pattern of international trade and the behavior of the international financial system, with careful attention to the problems of government policy in both the highly developed and the less developed countries.

570 *International Finance and Investment.* (3)
An intensive study of the international financial system, with special attention to its relationship to the balance of payments and economic development. Prereq: ECO 471.

571 *International Commercial Policy.* (3)
America's position in the world economy and its international accounts; United States tariff policies; war debts, financial cooperation and investment policy. Three class hours per week. Prereq: ECO 471. (Same as BA 556.)

671 *International Economics Seminar I.* (3)
History and analysis of theories of international trade; theories of international equilibrium and mechanisms of equilibrium adjustments; theory of economic integration. Prereq: ECO 471.

672 *International Conflict and Conflict Resolution.* (3)
A study of the interrelationships of commerce and violence in the world economy; static and dynamic theories of conflict; the institutional analysis of war; war and trade as policy alternatives. Three class hours per week. Prereq: ECO 360 and ECO 361 or consent of instructor.

771 *International Economics Seminar II.* (3)
Trade and economic development; determination of international payments equilibrium; econometric studies in world trade; computation of terms of trade; new developments in trade theory. Prereq: ECO 471.

ECONOMIC DEVELOPMENT

475 *Economic Development.* (3)
A comparative study of economic progress in selected countries; growth patterns, theories of development and capital formation; interaction of social and economic change. Prereq: ECO 261.

573 *Topics of Economics in Developing Areas.* (3)
The process of economic development in various developing countries, impediments to development, and programs for the promotion of development. May be repeated for a maximum of six credits. Prereq: ECO 475 or consent of instructor.

595 *Economic Planning.* (3)
Creation of development plans for the underdeveloped economies. Topics included the internal content, administrative structures and procedures for implementation, and economic policies. Prereq: ECO 360 or equivalent.

673 *Seminar in Economic Development I.* (3)
An intensive study of growth models, with special attention to problems associated with capital accumulation, balanced growth, and low-level equilibrium. Prereq: ECO 475 or equivalent.

674 *Agriculture and Economic Development.* (3)
Analytical consideration of role of agriculture in economic development in relation to over-all development strategy at various stages of growth. Theoretical and policy issues of particular relevance to the agricultural development in underdeveloped agrarian economies with various resource, social, political and economic systems. Prereq: ECO 475 or consent of instructor. (Same as AEC 626.)

773 *Seminar in Economic Development II.* (3)
Comprehensive survey of the literature on specific aspects of economic development, including industrialization, foreign trade policy, foreign aid, foreign investment, demographic problems, and stimulation and mobilization of savings. Prereq: ECO 475.

LABOR ECONOMICS

476 *Labor Economics.* (3)
Insecurity, wages and income, substandard workers, industrial conflict, wage theories, the economics of collective bargaining, unionism in its structural and functional aspects; recent developments. Prereq: ECO 261.

576 *Manpower Economics.* (3)
The impact of technology, the level of economic activity, and market imperfections on the labor market; evaluates manpower and other economic policies to provide jobs, improve labor market information and provide better preparation of people for jobs. Prereq: ECO 260 and 261.

577 *Labor Legislation.* (3)
The status of labor law, mediation, conciliation, arbitration, the minimum wage, the eight-hour day, unemployment relief, safety and health legislation, and social insurance. Prereq: ECO 261.

578 *Collective Bargaining.* (3)
The principles and procedures of bargaining and dispute settlement studied in detail. Includes a review of the content of labor contracts and provisions for administration. Union and management techniques considered. Prereq: ECO 476 or consent of instructor.

676 *Labor Markets and Wage Determination.* (3)
Economic and social forces determining labor supply and demand, labor force, unemployment, labor mobility; economic and institutional forces determining wages, wage theories and impact of collective bargaining. Prereq: ECO 360 and 361 or consent of instructor.

776 *Economics of Trade Unionism and Labor Law.* (3)
Origin and growth of labor organizations; trade union philosophy, organization and administration. Foreign labor movements. A detailed analysis of industrial relations and economic security legislation. Prereq: ECO 676 or consent of instructor.

PUBLIC FINANCE

479 *Public Finance.* (3)
A study of public receipts; public expenditures; the principles of taxation with special reference to their application to the tax systems, federal and state. Prereq: ECO 261.

580 *Theory of the Public Economy.* (3)
Application of economic and public finance theories to the income distribution, resource allocation, and economic stabilization problems associated with public sector use of resources. Prereq: ECO 360 and 361.

679 *Seminar in Public Finance I.* (3)
Reading and discussion of current and standard literature on public finance problems and the theory of the public economy. Individual research reports. Prereq: ECO 580, 479, or consent of instructor.

779 *Seminar in Public Finance II.* (3)
Essentially a continuation of ECO 679. Individual research reports. Prereq: ECO 580, 479, or consent of instructor.

REGIONAL ECONOMICS

482 *Regional Economics.* (3)
A survey of the major tools, measurements, and theories utilized in studying the regional economy. The topics covered include the basic elements of location theory, regional growth theory, and such economic models as economic base, input-output, and shift-share. Prereq: ECO 360 and 361.

682 *The Economics of Spatial Relations.* (3)
A study of the spatial aspects of the economy with emphasis on location theory in a static equilibrium and dynamic framework. Empirical evidence and public policy considerations are also included. Prereq: ECO 361 or equivalent.

683 *Economics of Growth and Development in Regions and Urban Areas.* (3)
A macroeconomic study of regional-urban growth and development with primary emphasis on the construction of income determination and growth models for an open economy. Prereq: ECO 360 or equivalent.

783 *Seminar in Regional Economics.* (3)
A critical study of recent extensions in regional economic analysis and regional policy programs. Individual research paper is required. Prereq: ECO 682 and 683.

MONETARY ANALYSIS

485 *Money and Banking.* (3)
Nature and functions of money; the importance of credit; relation of money and credit to prices; bank deposits, and loans; complete study of our national banking system. Prereq: ECO 360 or consent of instructor.

686 *Advanced Money and Banking.* (3)
A theoretical study of contemporary money and banking institutions with emphasis on central bank functions. Prereq: ECO 485 or equivalent.

687 *History and Theory of Money and Prices.* (3)
The evolution of money, the rise of banking processes and the causes of fluctuations in the general price level. Prereq: ECO 485.

786 *Seminar in Monetary Theory and Policy.* (3)
A comprehensive and critical analysis of contemporary monetary theory and policy. Prereq: ECO 686.

MATHEMATICAL ECONOMICS

590 *Introduction to Mathematical Economics.* (3)
A review of mathematical approaches to economic theory. Models applicable to production, marketing and pricing problems. Prereq: ECO 361 or equivalent. (Same as AEC 590.)

688 *Mathematical Economics—Micro Theory.* (3)
Consumer behavior and demand, theory of the firm, market equilibrium, optimality criteria and welfare maximization. Selected topics in dynamics. Prereq: ECO 361, MA 113 or equivalent.

788 *Mathematical Economics—Macro Theory.* (3)
Selected aggregative models treated mathematically. Emphasis on maximization problems for linear systems. Leontief input-output models. Prereq: ECO 360, MA 113 or equivalent. (Same as AEC 690.)

ECONOMETRICS

591 *Survey Sampling Design.* (3)
Sampling theory applied to research design and data collection in economics. Covers simple random, stratified random, systematic, and cluster sampling. Prereq: ECO 391 or consent of instructor.

592 *Advanced Business and Economic Statistics.* (3)
Advanced time series analysis, multiple and partial correlation, elementary analysis of variance and experimental design. Prereq: ECO 391 or consent of instructor.

692 *Econometrics I.* (3)
Foundations of econometrics. Analysis of linear regression models, including inferences involving linear transformations of random variables, individual degrees of freedom and the analysis of covariance. Statistical forecasting of economic magnitudes. Prereq: ECO 391 and ECO 592 or equivalent.

791 *Problems in Econometrics.* (3)
Empirical estimation of multi-equation models. Bayesian estimation theory and techniques. Non-linear estimation techniques. Supervised empirical work requiring a major research paper. Prereq: ECO 792.

792 *Econometrics II.* (3)
The application of statistical methods to problems of economic analysis. Building and measuring relationships among economic variables. Econometric models of the economy as a whole and of individual sectors. Prereq: ECO 692 or equivalent. (Same as AEC 691.)

793 *Seminar in Econometrics.* (3)
Comprehensive consideration of current empirical literature. Individual dissertation progress reports and discussion. Prereq: ECO 791 or consent of instructor.

ADDITIONAL COURSES IN ECONOMICS

495 *Comparative Economic Systems.* (3)
A study of capitalism, socialism, fascism, communism and cooperation, with attention to current experiments in economic planning. Prereq: ECO 261.

523 *Social Determinants of Economic Behavior.* (3)
A study of the sociology of consumption, the effect of social values upon business and employee behavior, and the socioeconomic implications of welfare legislation. (Same as SOC 523.) Prereq: SOC 101.

560 *Business Combinations and Public Policy.* (2)
Forms of combinations; the problem of monopoly and the regulations of competition; federal and state anti-trust legislation and court decisions. Prereq: ECO 261.

594 *Transportation.* (3)
Railways, waterways, highways, airways. Rates, services, management, regulation. Prereq: ECO 261.

596 *Soviet Area Economics.* (3)
The course is designed to provide an intensive study of economic principles, institutions, and policies which provide direction and coordination for the economic processes in the Soviet Union and Eastern European countries. Prereq: ECO 261 or consent of instructor.

696 *Soviet Area Economics Seminar.* (3)
Theory and implementation of central planning in Soviet Union and other socialist economies. Special emphasis on East European reform models of socialist planning. Prereq: ECO 360 and 361 or consent of instructor. (Completion of ECO 596 or equivalent desirable.)

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence.

769 *Residence Credit for Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.

796 *Seminar.* (1-6)
An extended original investigation of some specific topic with a view to giving training in methods of research and studying intensively a particular subject in the field of economics. May be repeated to a maximum of six credits.

797 *Research Problems in Economics.* (1-6)
Students confer individually with the instructor. May be repeated to a maximum of six credits.

IV. EDUCATION

General Statement of Regulations Governing Graduate Work in the College of Education

The college offers the following degrees in education: Master of Arts, Master of Science, Specialist, Doctor of Education and the Doctor of Philosophy. In addition to the general requirements for graduate degrees (pages 20-28) certain other requirements must be met.

Graduate work is also provided for persons seeking rank I or II certification. (For rank II requirements without a degree, see page 203. Rank I consists of a 30 semester hour planned program above the Master's degree.)

1. Candidates must complete a minimum of 30 semester hours in education (undergraduate work in education may be counted to meet this requirement.)
2. Candidates must qualify for a Kentucky Teaching Certificate. (In special cases candidates whose preparation is not for work in schools may, upon petition, have this requirement waived.)
3. Candidates for doctoral degrees must have completed three years of teaching or other professional school experience.

The two plans which lead to the degree of Master of Arts or Master of Science in Education are outlined below.

PLAN A

1. A minimum of 24 semester hours of graduate work must be completed and a thesis must be presented.
2. At least 12 semester hours of graduate work must be in education.
3. At least 12 semester hours of graduate work must be in courses numbered 600 or higher.
4. At least 12 semester hours must be outside the field of education, except for majors in educational administration, counseling and guidance, and vocational education, other than home economics education. It is expected that students in educational administration, counseling and guidance, and vocational education will have six hours outside education.
5. No student may satisfy more than one-half of the residence requirements for advanced degrees by part-time work. This limitation does not apply to intensive courses.
6. The total number of credits presented in education, undergraduate and graduate, must be at least 30 semester hours.
7. A standing of 3.0 (an average of B) or better must be made on all graduate work.
8. Six semester hours (if approved by the graduate adviser) may be completed in off-campus study (that is, extension work). In such case, however, a minimum of 30 weeks of *resident on-campus* work is required for the master's degree.

9. The Graduate Record Examination is required of all candidates for graduate degrees. It is to be taken the first semester the student is enrolled as a full-time student in the Graduate School. The National Teachers Examination will be required of all candidates for the degree of Master of Arts in Education or Master of Science in Education. The student should consult with his adviser to determine the proper time to take this examination. In exceptional cases an additional examination, either written or oral, may be required. These examinations are to be taken just prior to or during the session in which the degree is to be conferred.
10. All graduate students must meet the requirements for a teaching certificate in Kentucky as established by the State Department of Education of Kentucky. These requirements are outlined in the General Catalogue of the University. If deficiencies are found, they should be overcome before proceeding with graduate work. The work required to overcome these deficiencies is in addition to the minimum graduate requirements for the degree.

PLAN B

1. A minimum of 30 semester hours of graduate work must be completed.
2. At least 12 semester hours of graduate work must be in education.
3. At least 15 semester hours must be in courses numbered 600 or higher.
4. At least 12 semester hours must be outside the field of education, except for majors in educational administration, counseling and guidance, and vocational education, other than home economics education. It is expected that students in educational administration, counseling and guidance, and vocational education will have six hours outside education.
5. No student may satisfy more than one-half of the residence requirements for advanced degrees by part-time work. This limitation does not apply to intensive courses.
6. The total number of credits presented in education, undergraduate and graduate, must be at least 30 semester hours.
7. A standing of 3.0 (an average of B) or better must be made on all graduate work.
8. Six semester hours may be done in extension classes, off-campus study, or independent work courses with the permission of the student's adviser and the dean of the Graduate School.
9. The Graduate Record Examination is required of all candidates for graduate degrees. It is to be taken the first semester the student is enrolled as a full time student in the Graduate School. The National Teachers Examination will be required of all candidates for the degree of Master of Arts in Education or Master of Science in Education. The student should consult with his adviser to determine the proper time to take this examination. In exceptional cases an additional examination, either written or oral, may be required. These examinations are to be taken just prior to or during the session in which the degree is to be conferred.

10. All graduate students must meet the requirements for a teaching certificate in Kentucky as established by the State Department of Education of Kentucky. These requirements are outlined in the *General Catalogue* of the University. If deficiencies are found, they should be overcome before proceeding with graduate work, and in addition to the minimum 30 graduate credits required for the degree.

Each student's graduate curriculum must be a well-rounded program of courses related to the student's major interest and approved by his committee. In cases of deficient preparation the committee, with the approval of the Dean, determines prerequisite undergraduate courses to be taken. Each department has designated one or more faculty members to direct graduate studies in their department. Specific questions regarding programs may be referred to these people.

DEPARTMENT	DIRECTORS
Administration & Supervision	James Kincheloe Robert Ogletree
Curriculum & Instruction	Harry Barnard, Secondary Education James Moore, Elementary Education Earl Rankin, Reading
Educational Psychology & Counseling	James Barclay Louis Karmel
Health, Physical Education & Recreation	Joseph Gruber
Higher & Adult Education	Collins Burnett
Social & Philosophical Studies in Education	David Denton
Special Education	A. Edward Blackhurst
Vocational Education	Harold Binkley Vernon Musselman, Business Education Marjorie Stewart, Home Economics Education

Education 99—This is a non-credit seminar required of all graduate students in education the first semester or summer session they are registered for full-time graduate study. This course meets only on one occasion.

Master of Arts Degree in Elementary Education

For a Master of Arts degree in Elementary Education, a minimum of 12 semester hours of graduate work shall be selected from at least three of the following areas of professional education in accordance with the needs of the

individual teacher. This program qualifies the teacher for a Standard Certificate if he has completed the four-year undergraduate curriculum. The specific courses listed below under each area shall be used to meet the requirements:

Area 1—*Research Methodology*

EDP 522—Educational Tests and Measurements
EDP 656—Methods of Educational Research
EDP 657—Educational Statistics

Area 2—*The Psychology of Learning*

EDP 548—Educational Psychology
EDP 658—Problems in Educational Psychology

Area 3—*Foundations in Education*

EDF 640—Philosophy of Education
EDF 645—Foundations in Education
EDF 650—History of Western Education
EDF 651—History of Education in the United States
EDF 661—Educational Sociology

Area 4—*A Seminar in Instruction Devoted to the Method of Teaching*

Any general course in methods or any specific course in methods in subject matter areas may be taken to meet this requirement.

Area 5—*A General Study of Curriculum Development*

EDC 712—The Elementary School
EDC 732—Principles of Curriculum Construction

Area 6—*Advanced Study in Human Growth and Development*

EDP 739—A Survey of Research in Human Development and Education
EDP 755—Human Development and Behavior
EDP 759—Identifying and Providing for Individual Student Needs

Area 7—*Advanced Study in Reading* (Required unless waived on basis of previous study in reading)

EDC 540—The Analysis and Correction of Reading Disabilities
EDC 641—A Study of Research and Theory in Teaching Reading in the Elementary School
EDC 642—A Study of Research and Theory in Teaching Language Arts in the Elementary School

Master of Science Degree in Higher and Adult Education

This degree is intended for persons interested in working with teachers and administrators who desire to prepare for administrative positions in higher education, or who desire a background in higher education as a supportive area to college teaching. The department's basic purpose is to work with qualified persons who are moving toward career goals in administration in two-year or four-year colleges and universities. The department welcomes qualified students regardless of their primary disciplines and recognizes that course experiences from other disciplines may make a very important contribution to the graduate student's understanding of higher and adult education. Therefore, this program does not require the typical minimum of 30 semester hours in education at the undergraduate and graduate level. Since certification is not typically required for teaching or administration in most colleges and universities, this is a non-certificate program.

Minimum Requirements for a Master of Science Degree in Higher and Adult Education

Courses in Higher and Adult Education	9 hrs.
Research Design and Statistics	3 hrs.
Electives in Education Outside the Major Department	6 hrs.
Work Outside the College of Education	6 hrs.
Electives from the above categories	6 hrs.

Master of Arts Degree in Secondary Education

For a Master of Arts degree in Secondary Education, a minimum of 12 semester hours of graduate work shall be selected from at least three of six areas of professional education in accordance with the needs of the individual teacher. This program qualifies the teacher for a Standard Certificate if he has completed the four-year undergraduate curriculum. For Areas 1, 2, 3, and 4 the specific courses are the same as those listed under Areas 1-4 in the aforementioned section, Master of Arts degree in Elementary Education. The specific courses in areas 5 and 6 listed below shall be used to meet the requirements:

Area 5—A *General Study of Curriculum Development*

EDC 714—The Secondary School (for secondary school teachers only)
EDC 717—The Junior High School (for junior high school teachers only)
EDC 732—Principles of Curriculum Construction
EDC 735—The Core Program in the Secondary Schools

Area 6—*Advanced Study in Human Growth and Development*

EDP 739—A Survey of Research in Human Development and Education
EDP 755—Human Development and Behavior
EDP 759—Identifying and Providing for Individual Student Needs

Area 7—*Advanced Study in Reading*

EDC 540—Analysis and Correction of Reading Problems in the Classroom
EDC 643—A Study of Research and Theory in Teaching Reading in the Secondary School
EDC 646—Organized Reading Programs

Master's Degree in Vocational Education

For a master's degree in vocational education (agricultural education, business education, distributive education, home economics educatoin, industrial education, or vocational education) a minimum of 12 semester hours of graduate work must be taken in professional education. One course shall be taken from three of six areas—1 through 6. This program qualifies the teacher for a Standard Certificate if he has completed a four-year undergraduate curriculum.

ALL PROGRAM SERVICE AREAS

Area 2—*Research*

EDP 522—Educational Tests and Measurements
EDP 656—Methodology of Educational Research
EDP 657—Educational Statistics

Area 3—*Advanced Study in Human Development*

SOC 521—Industrial Sociology
SOC 542—Human Relations in Administration
EDP 739—Survey of Research in Human Development and Education
EDP 755—Human Development and Behavior
EDP 759—Identifying and Providing for Individual Student Needs

Area 4—*Psychology of Learning*

PSY 540—Industrial Psychology
EDP 548—Educational Psychology
EDP 658—Problems in Educational Psychology

Area 6—*Foundations in Education*

EDF 640—Philosophy of Education
EDF 645—Foundations of Education
EDF 651—History of Education
EDF 655—Comparative Education
EDF 661—Educational Sociology (Same as SOC 661.)

AGRICULTURAL EDUCATION

Area 1—*Curriculum Development*

EDV 672—Determining Content in Vocational Agriculture
EDC 732—Principles of Curriculum Development

Area 5—*A Seminar in Instruction Devoted to Method in Teaching*

EDV 670—Advanced Method in Teaching Vocational Education
EDV 675—Modern Problems in Agricultural Education
EDV 677—Advanced Problems in Agricultural Education
EDV 679—Adult-Farmer Schools
EDV 680—Directing Farm Practice
EDV 681—Teaching Farm Shop
EDV 682—Young-Farmer School

BUSINESS EDUCATION

Area 1—*Curriculum Development*

EDV 615—Problems in Business Education
EDV 621—The Business Curriculum
EDV 626—Classification and Possible Use of Community Resources in Business Education
EDC 714—The Secondary School
EDC 732—Principles of Curriculum Development

Area 5—*A Seminar in Instruction Devoted to Method of Teaching*

EDV 511—Teaching Secretarial Subjects
EDV 512—Teaching Bookkeeping and Accounting
EDV 513—Teaching Office Practice, Clerical Practice, and Office Appliances
EDV 615—Problems in Business Education
EDV 618—The Social Business Subjects in High School
EDV 774—Seminar in Business Education
EDV 779—Seminar in Vocational Education

DISTRIBUTIVE EDUCATION

Area 1—*Curriculum Development*

EDV 517—Determining Teaching Content in Distributive Education
EDC 732—Principles of Curriculum Development

Area 5—*A Seminar in Instruction Devoted to the Method of Teaching*

EDV 526—Organization and Operation of Adult Programs in Distributive Education

EDV 528—Techniques in Teaching Distributive Education
EDV 610—Simulated Occupational Experience Programs in Distributive Education
EDV 670—Teaching Vocational Education
EDV 671—Youth Organizations in Vocational Education

HOME ECONOMICS EDUCATION

Area 1—*Curriculum Development*

EDV 685—Home Economics Curriculum Construction
EDC 732—Principles of Curriculum Construction

Area 5—*A Seminar in Instruction Devoted to Method of Teaching*

EDV 683—Current Problems in Home Economics Education
EDV 686—Evaluation in Home Economics Education
EDV 687—Supervision in Vocational Education

INDUSTRIAL EDUCATION

Area 1—*Curriculum Development*

EDV 678—Selecting Teaching Materials
EDC 732—Principles of Curriculum Construction

Area 5—*A Seminar in Instruction Devoted to Method of Teaching*

EDV 518—Methods in Industrial Education (4 hours)
EDV 529—Evaluation in Industrial and Distributive Education
EDV 534—Organization and Operation of Part-Time and Evening Classes
EDV 670—Advanced Method in Teaching Vocational Education

VOCATIONAL EDUCATION

Area 1—*Curriculum Development*

EDV 517—Determining Teaching Content in Distributive Education
EDV 621—The Business Curriculum
EDV 672—Determining Content in Vocational Agriculture
EDV 685—Home Economics Curriculum Construction
EDC 732—Principles of Curriculum Development

Area 5—*A Seminar in Instruction Devoted to Method of Teaching*

EDV 516—Problems of the Coordinator in Industrial and Distributive Education
EDV 518—Methods in Industrial Education
EDV 523—Vocational Guidance
EDV 528—Techniques of Teaching Distributive Education
EDV 603—Teaching Disadvantaged Youth and Adults
EDV 615—Problems in Business Education
EDV 670—Method in Teaching Vocational Education
EDV 693—Supervision in Vocational Education
EDV 694—The Administration of Vocational Education

Master of Arts Degree in Education—Guidance and Counseling

The introductory statement pertaining to the Master of Arts degree for teachers does not apply in Guidance and Counseling. However, any person who has the Master's degree in Guidance and Counseling and who wishes to qualify as a school administrator must first meet all requirements for the Master of Arts for teachers.

The curriculum for the master's degree requires 30 semester hours of course work under Plan II or 24 hours of course work and a thesis under Plan I.

It includes courses in the areas of human development and behavior testing, individual and group counseling, guidance, educational sociology and a supervised practicum in counseling of from three to nine hours. Students typically select nine hours from related sociology and psychology courses.

For further information contact the Director of Graduate Studies in the Department of Educational Psychology and Counseling.

Students specializing in rehabilitation counseling are required to take the following. The option does not qualify one for a school counselor certificate.

ANA 206	Elementary Anatomy	3
EDP 521	Introduction to Vocational Rehabilitation	3
EDP 522	Educational Tests and Measurements *or*	3
PSY 535	Psychological Testing	3
EDP 527	Survey of Physical and Neurological Defects	3
EDP 657	Educational Statistics	3
EDP 664	Studies in Vocational Rehabilitation	3
EDP 760	Counseling Theory and Practice	3
EDP 761	Supervised Practice in Counseling	3
EDP 764	Using Occupational and Educational Information in Counseling and Guidance	3
EDP 777	Seminar in Counseling and Guidance	3
PSY 521	Abnormal Psychology	3
PSY 544	Social Psychology	3
SOC 527	Health and Society	3
EDP 763	Research and Evaluation in Guidance	3

In addition the student will be expected to successfully complete an internship experience.

SIXTH-YEAR DEGREE PROGRAM COUNSELING AND GUIDANCE

Curriculum for the Ed.S. degree (30 semester hours required) Sem. Hrs.

Required: 15-21 hours from the following, in addition to the courses required for the master's degree in Guidance and Counseling.

EDP 657	Educational Statistics	3
EDP 761	Supervised Practice in Counseling (May be repeated to a maximum of 9 hours)	3
EDP 762	Organization and Administration of Guidance Services	3
EDP 763	Research and Evaluation in Guidance	3
EDP 764	Using Occupational and Educational Information in Guidance and Counseling	3
EDP 777	Seminar in Guidance and Counseling (May be repeated to a maximum of 6 hours)	3
PSY 640	Practice in Testing: Intelligence Tests	3

Electives: 6-9 hours outside of Education (to be approved by adviser)

Research: 3-6 hours in independent research as approved by adviser

Master of Arts Degree in Education—Special Education

The completion of 30 semester hours of course work under Plan II or 24 hours of course work and a thesis under Plan I within the framework of the general regulations of the Graduate School and the College of Education is required for the master's degree in Special Education. A student without a teaching certificate must meet deficiencies including certification requirements outlined by his adviser in addition to completing the 30 semester hours.

The Master of Arts degree in Education with an area of concentration in Special Education which follows the curriculum in Special Education is valid

for the Provisional Certificate only, unless all other requirements for the Master of Arts degree in Elementary or Secondary Education have been met.

All undergraduate requirements for a provisional teaching certificate must be met before this program can be completed for teacher certification in the Special Education Area.

Students may emphasize one of the following specialties within the framework of the Master's degree in Special Education:

1. Teacher of the Mentally Retarded
2. Teachers of the Orthopedically and Neurologically Handicapped
3. Teachers of the Emotionally Disturbed
4. Speech Pathology and Audiology

MINIMUM REQUIREMENTS FOR TEACHERS OF HANDICAPPED CHILDREN

Special Education	12 hours
Educational Psychology and Counseling	3 hours
Social and Philosophical Studies in Education	3 hours
Graduate level coursework outside the College of Education	12 hours

At least 15 semester hours must be earned in courses at the 600 and 700 levels.

Special requirements for speech pathology: Candidates for the M.A. degree in Education with concentration in speech pathology are encouraged to meet the academic and clinical requirements for the Certificate of Clinical Competence from the American Speech and Hearing Association. Briefly, these requirements include: (a) 18 semester hours in courses that provide fundamental information applicable to the normal development and use of speech, hearing and language, (b) 42 semester hours in courses that provide information about and training in the management of speech, hearing, and language disorders and that provide information supplementary to these fields, and (c) completion of 275 clock hours of supervised, direct clinical experience with individuals presenting a variety of disorders of communication. All or part of requirements (a) and (c) may be fulfilled on the undergraduate level. However, 30 of the 42 hours of requirements (b) must be in courses acceptable toward a graduate degree. M.A. candidates in speech pathology must complete at least 12 hours from the 600-700 level courses in speech pathology listed under Special Education .

PLANNED FIFTH YEAR PROGRAM

By action of the Council on Public Higher Education and the State Board of Education, all provisional teaching certificates issued *after* 1967 on the basis of a four-year program and a Bachelor's degree are valid for an initial period of ten years and shall be renewed either upon completion of a Master's degree or a planned Fifth Year Program of college work. Conditions of the "Planned Fifth Year Program" are outlined below.

Candidates for admission must be graduates of accredited four-year institutions and hold a valid teaching certificate.

The program must be completed within ten years. Grades of "C" or better are required in all work applied to the program.

Thirty-two semester hours must be completed under the supervision of an adviser.

At least 18 semester hours must be earned at the University of Kentucky.

At least 12 hours must be in courses numbered 600 or above.

At least 12 semester hours must be in professional education.

At least 12 hours must be in disciplines other than education.

PROGRAMS IN EDUCATIONAL ADMINISTRATION AND SUPERVISION

Beginning in September, 1970, all persons entering the program in Administration and Supervision must have completed a Master's degree in Education.

REQUIREMENTS FOR THE PROFESSIONAL CERTIFICATE

Separate professional certificates for administrators and supervisors of various types are endorsed for specific positions. The requirements for each position are different. Professional certificates are given for the following positions: superintendent, supervisor, elementary principal, secondary principal, and director of pupil personnel.

For information on specific pre-requisities and requirements for the professional certificates and the Rank I programs, a classification for salary purposes, write the Director of Graduate Studies in the Department of Administration and Supervision.

GRADUATE COURSES IN EDUCATION

ADMINISTRATION AND SUPERVISION

502 *The Administration of Pupil Personnel.* (3) S
Administrative problems relating to child accounting, including school census, attendance records and reports, social and economic factors affecting school attendance, and duties and responsibilities of school and non-school personnel and agencies. *Staff.*

601 *Administration of Educational Organizations.* (3)
A study of the historical development of educational administration, administrative processes, the application of theory and values in decision-making and an introduction to modern management methods applied to education.

602 *Organization and Administration of American Education.* (3)
An analysis of the administration of local, state and federal education agencies and their relationships. A study of the administrative tasks in these agencies.

603 *Constitutional and Legal Basis of Public School Administration.* (3) II, S
A study of court decisions to discover the legal principles involved in practical problems of school administration. Prereq: Admission to program in Administration and Supervision. *Staff.*

604 *School Buildings and Equipment.* (3)
Measurement and evaluation of existing school building facilities, planning new buildings, determining suitable equipment, and financing the building program. Prereq: Admission to program in Administration and Supervision. *Staff.*

608 *Internship in Educational Administration.* (3) I, II, S
Field experiences are provided for prospective administrators under the cooperative supervision of University personnel and principals, supervisors, and superintendents in Kentucky public school systems. May be repeated to a maximum of six credits. Prereq: Admission to program in Administration and Supervision. *Staff.*

628 *Field Studies in Educational Administration and Supervision.* (3)
Study and evaluation of the major areas of school operation in actual field situations. Emphasis upon the synthesis of knowledge through surveying, evaluating and developing recommendations for the improvement of the school operation. Prereq: Consent of instructor.

629 *The Principal.* (3)
An analysis of the building unit as a sub-system within a larger complex organization. Special emphasis on the changes in the role of the principal as a result of changes in society and in the schools. Prereq: Admission to department program or consent of instructor.

633 *Administration and Supervision of Instructional Programs.* (3)
A study of the role of organizational leadership in the development of instructional goals, instructional programs, evaluation procedures and procedures for educational changes.

634 *Administration of Educational Personnel.* (3)
Consideration of the motivation and management of educational personnel with special emphasis on the professional in complex organizations. Attention is given to the theory and practice of collective bargaining in education.

635 *Business Administration and Finance of Public Education.* (3) II, S
A course for prospective superintendents. Emphasizes school support, including state, local, and federal revenues; budgetary policy; procedures for purchasing, accounting, and reporting costs; management of funds, property, equipment, and supplies; payroll procedures, records, and reports. *Staff.*

639 *The Supervisor.* (3)
A study of the role of the supervisor of instruction as part of administrative leadership in improving instructional programs with special emphasis on in-service education of staff. Prereq: Admission to program or consent of instructor.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

771 *Seminar in Administration.* (3) II, S
A critical study of selected problems in school administration. The course is designed primarily for students who have had some administrative experience. Prereq: Admission to program in Administration and Supervision. May be repeated to a maximum of six credits. *Staff.*

772 *Seminar in Education.* (1) I, II
A course planned for graduate students majoring in education, given under the direction of the faculty of the College of Education. May be repeated to a maximum of two credits. *Staff.*

785 *Independent Work in School Administration.* (3) I, II
Research on a practical problem in school administration. Open only to students with at least one semester of graduate work in education. Approval of instructor necessary before registration. May be repeated to a maximum of six credits. *Staff.*

792 *Research in Educational Administration and Supervision.* (3)
Critical examination of representative research studies in administration and related fields. Emphasis upon the students' defining and delimiting an appropriate problem in Educational Administration and Supervision, generating a design appropriate to the problem and selecting appropriate techniques of analysis. Prereq: Admission to program.

CURRICULUM AND INSTRUCTION

533 *Teaching Reading in the Secondary School.* (3)
A study of current methods and materials useful in teaching reading in secondary schools with particular emphasis on the improvement of reading in the content areas.

538 *Advanced Arts and Crafts in the Elementary School.* (3)
Planned to give the elementary teacher an understanding of teaching methods involved in, and construction of, art activities which would enrich the classroom program.

539 *The Elementary Curriculum.* (3)
The philosophy and techniques of curriculum construction and some practical work in construction.

540 *Analysis and Correction of Reading Problems in the Classroom.* (3)
A study of current methods and materials useful in the analysis and treatment of reading problems in the classroom. Students will observe and participate in the diagnosis and treatment of corrective reading problems. Prereq: EDC 329 or 533.

542 *Children's Literature.* (3)
Planned to acquaint students with literature for children, kindergarten through grade 8. Review of interests at different ages. Discussion of types of literature—folklore, modern fairy tales, myths and legends, realistic stories, biography and poetry.

543 *Teaching in the Kindergarten.* (3)
The nature, development and education of the child of kindergarten age. Organization, equipment, curriculum, and procedures used with children of this age. Regular periods are scheduled for observing and participating in the kindergarten.

544 *Utilization of Educational Media.* (3)
Surveys the broad area of educational media with an emphasis on utilization and the advantages and disadvantages of the various media. Provides experience in relating educational technology to productive learning activity. (Same as LS 586.)

545 *Preparation of Instructional Materials.* (3)
Develops a basic pattern for the preparation of a wide variety of instructional materials. Laboratory practice is provided for the production of materials for projected and non-projected use. Source of free and inexpensive materials will be identified and evaluated. Lecture, 2 hours; lab, two hours.

546 *Introduction to Early Childhood Education.* (3)
Survey of early childhood educational programs with emphasis on principles, purposes, values and contemporary problems. A study of current literature and research related to these aspects for developing programs for young children. Lecture, three hours. Prereq: Permission of instructor.

549 *Sociological Aspects of Mass Communication.* (3)
The relationship between the organization of modern society and its communication media: Special emphasis is given to the way in which cultural processes and social change have an impact upon the mass media, and upon the way in which the mass media influence cultural processes and social change. The social-psychological bases of communication are studied within a context of theory and research. (Same as SOC 549.) Prereq: 6 hours of sociology, SOC 101.

552-557 *Modern Educational Problems.* (3 ea)
A brief survey of some of the problems in modern education.

559 *Modern Educational Problems: Community Organization in Adult Education.* (3)
Problems of community organization as they affect the adult life of the citizens of the community served.

560-576 *Modern Educational Problems.* (3 ea)
A brief survey of some of the problems in modern education.

596 *Science in the Elementary School.* (3)
A background of elementary science usable with children in the first six grades. Includes planning units of work, organizing and using materials, and references, making bibliographies for teachers and children, illustrated materials, and excursions.

600 *Workshop in Reading.* (1-3)
An intensive workshop dealing with materials and techniques in teaching reading. Study of new techniques, examination of materials; lectures by specialists. Class 1-3 weeks, 8 hours per day. May be repeated for a maximum of three hours. Prereq: Undergraduate degree.

606 *Instructional Television in the Classroom.* (3)
Emphasizes the classroom utilization of instructional television. Includes the psychology of listening; problems of evaluation; the writing, producing, and scheduling of school telecasts; and the sources of telecasting for school use. Research studies in the area will be investigated. Three class hours per week.

607 *Programmed Instruction in the Classroom.* (3)
Investigates aspects of programmed instruction in its various levels of complexity. Studies programmed books, "teaching machines," computerized instruction, and the systems approach to instruction. Emphasis is placed upon research in the area. Three class hours per week.

619 *Diagnosis of Reading Disabilities.* (3)
Clinical techniques for the diagnosis of reading disabilities. A course designed to develop both theoretical understandings and operational skills in clinical diagnosis of reading problems. Two hours of lecture. Two hours of laboratory. Prereq: EDC 540 or permission of instructor.

620 *Reading Remediation.* (3)
Clinical techniques used in the remediation of reading problems. A course designed to develop individualized remedial procedures related to diagnosis. Two hours of lecture. Two hours of laboratory. Prereq: EDC 619 or permission of instructor.

641 *A Study of Research and Theory in Teaching Reading in the Elementary School.* (3)
A systematic study of the research and theory and their application to the teaching of reading in the elementary school. Attention will be given to new developments in the field. Prereq: EDC 329 and work in linguistics.

642 *A Study of Research and Theory in Teaching Language Arts in the Elementary School.* (3)
A systematic study of the research and theory and their application to the teaching of listening, oral and written communication, spelling, and handwriting in the elementary school. Attention will be given to new developments in the field. Prereq: EDC 329 and work in linguistics.

643 *A Study of Research and Theory in Teaching Reading in Secondary Schools.* (3)
A systematic study of the research and theory and their application to the teaching of reading in the secondary schools. Attention will be given to new developments in the field. Prereq: EDC 533 and work in linguistics.

646 *Organizing Reading Programs.* (3)
Procedures in establishing and administering reading programs in elementary and secondary schools. Two hours of lecture. Two hours of laboratory. Prereq: Nine hours of graduate reading courses.

680 *Internship in Teacher Education.* (6)
A required component of the special Five Year Program for elementary, junior high, and senior high school teachers, this course is an on-the-job laboratory experience in which a teacher with a Provisional Certificate works under the direct supervision of a coordinator from the Department of Curriculum and Instruction. May be repeated once to a maximum of 12 credits. Prereq: Graduate student; admission to a specially designed program in Teacher Education.

712 *The Elementary School.* (3)
Recent research and modern trends in teaching the skills and content subjects in the elementary school. Planned for supervisors, superintendents, principals, and teachers for better understanding of a modern elementary school.

714 *The Secondary School.* (3)
A course designed to acquaint the secondary teacher and the administrator with the nature and function of the secondary school.

717 *The Junior High School.* (3)
A study of the unique functions of the junior high school. Scope and sequence of the curriculum, school organization and guidance as related to the young adolescent will be considered. A course for principals, supervisors, teachers.

724 *Organization and Supervision of Student Teaching.* (3)
A course designed for teachers preparing to become supervising teachers. The basic principles apply to both elementary and secondary education. Includes a presentation of the experiences deemed important in developing students into effective teachers.

730 *Problems of the School Curriculum.* (3)
Problems in the field of the school curriculum and in the preparation of instructional materials. Students enrolling in this course are required to leave on file with the College of Education a complete report of each problem studied. May be repeated to a maximum of six credits.

732 *Principles of Curriculum Construction.* (3)
Study of basic principles of curriculum development. Relationship of social and psychological factors to curriculum change. Survey of current approaches to curriculum organization. Consideration of means of curriculum development in school systems.

735 *The Core Program in the Secondary Schools.* (3)
Deals with the philosophical and psychological bases of the core program and gives major emphasis to problems of teaching in the core class. A course designed for teachers, principals, supervisors.

740 *Practicum in Teaching Reading and Related Language Arts.* (3)
Supervised practicum in analyzing problems in reading and related language arts and providing remedial work. Requires six hours per week in practicum with individual children or groups, plus two hours per week in seminar. May be repeated once to a maximum of six credits. Prereq: EDC 619 and 620.

742 *Administration and Supervision of Public School Music.* (3)
A study of current trends in school music, curricula, testing programs, and other supervisory procedures. (Same as MUS 742.)

743 *Advanced Methods and Materials in Music Education.* (2)
Survey and evaluation of new public school music methods and materials.

744 *History and Philosophy of Music Education.* (3)
A historical survey of thought concerning the place and significance of music in the education of the individual and the group. (Same as MUS 744.)

745 *Administration of Educational Media Programs.* (3)
Stresses the operation of educational media programs considering budgeting, training of personnel, duties of staff, sources of materials, and the purchase of equipment. Previews are made of many educational media and attention is given to the special needs of the Instructional Materials Center.

746 *Motion Pictures in Education.* (3)
The history of the educational motion picture, technique in the use of films, educational scenario writing, grading and scoring films, and motion picture appreciation.

747 *Seminar in Reading.* (3)
A seminar for advanced graduate students. Critical discussion of theory and research under investigation by graduate students and faculty. May be repeated once. Prereq: 12 hours of graduate reading courses.

748 *Psychology of Reading.* (3)
A systematic examination of the psychological basis of the reading process. A study of psychological theory and research related to reading. Prereq: 12 hours of graduate reading courses.

749 *Extracurricular Activities.* (3)
The underlying principles and common practices of the co-curricular activities programs as developed in public schools. Home room activities, assembly programs, and clubs are the three major sections of the course; other activities included when necessary.

757 *College and Adult Reading.* (3)
The study of the reading process as it pertains to college students and adults. Emphasis will be placed on principles and procedures for teaching reading to this age group. Prereq: Permission of instructor.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely.

780 *Independent Work in Elementary Education.* (2)
An independent work course for students who have done a minimum of 12 semester hours of graduate work including EDC 712 or EDA 629. May be repeated to a maximum of four credits.

781 *Independent Work in Secondary Education.* (3)
An independent work course for students who have done a minimum of twelve semester hours of graduate work including EDC 714 or EDA 630. May be repeated to a maximum of six credits.

790 *Research Problems in Secondary Education.* (3)
An independent research course. Students confer individually with the instructor. Prereq: one year of graduate work. May be repeated to a maximum of six credits. *Cierley.*

791 *Research Problems in Elementary Education.* (3)
An independent research course. Students confer individually with the instructor. Prereq: one year of graduate work. May be repeated to a maximum of six credits.

EDUCATIONAL PSYCHOLOGY AND COUNSELING

519 *The Elementary School Pupil.* (2) I, S
The psychology of the child in the primary and intermediate grades. Prereq: one course in psychology.

520 *The Secondary School Pupil.* (3) II, S
The psychology of the pupil in junior and senior high school. Prereq: one course in psychology.

521 *Introduction to Vocational Rehabilitation.* (3)
Survey of vocational rehabilitation: historical, legal, and administrative aspects of rehabilitation services; survey of rehabilitation services; and the role of the counselor in rehabilitation process.

522 *Educational Tests and Measurements.* (3) I, S
The problems of measurement in the school program, with special emphasis on standardized tests. The construction and use of new-type tests, use and limitations of traditional examinations, marking systems, etc., are also considered.

548 *Educational Psychology.* (3) I, II, S
Application of psychology to the problems of learning and teaching.

550 *The Role of the Teacher and the Principal in Guidance.* (3) I, II, S
A first course for non-specialists; basic principles and practical approaches to guidance for prospective teachers and principals in service. *Staff.*

656 *Methodology of Education Research.* (3) II
A course intended to acquaint the student with the various techniques of research and to aid him in methods of attack on his own particular research problems. Prereq: 12 semester hours in education.

657 *Educational Statistics.* (3) I
A non-mathematical study of the applications of statistical and graphical methods to educational data.

658 *Problems in Educational Psychology.* (3) II, S
A critical survey of the psychological theories and research applicable to educational practices. Prereq: one year of psychology.

659 *Advanced Educational Measurement.* (3) II, S
Theory and application in educational measurement with emphasis on the appropriate selection, administration, and intepretation of standardized tests used in educational assessment. Three class hours per week. Prereq: EDP 522 or equivalent.

660 *Research Design and Analysis in Education.* (3)
A study of the research methodologies applicable in the several aspects of education. Emphasis is on the design of research and analysis of accumulated data. Three class hours per week. Prereq: EDP 657.

664 *Problems in Vocational Rehabilitation.* (3) I, II
A study of actual cases of vocational rehabilitation clients emphasizing the various kinds of disabilities, the functional implication of disability, and the contribution of professional personnel in medical, social, psychological, and vocational areas. Lecture, 2 hours; lab, 2 hours per week. Prereq: EDP 521.

665 *Practicum in Counseling Psychology.* (3) I, II, S
Supervised experience in application of diagnostic and interviewing techniques in a counseling service. May be repeated for a maximum of 12 credits. (Same as PSY 665).

707 *Multivariate Analysis in Educational Research.* (3)
A study of several techniques for the analysis of educational outcomes utilizing multiple variables. Three class hours per week. Prereq: EDP 660 or equivalent.

739 *A Survey of Research in Human Development and Education.* (3) II
A study of the research and principles of education and allied fields which are appropriate to a consideration of education as a developmental process. Prereq: Master's degree or by permission. *Staff.*

755 *Human Development and Behavior.* (3) I, S
The physiological, sociological, and psychological bases of human behavior with emphasis upon the normal school child in his environment. Findings of research in the behavioral sciences and their implications for the guidance of young persons.

756 *Fundamentals of Guidance.* (3) I, II, S
A survey of the educational, sociological, and psychological foundations of guidance in schools and colleges. Study of the basic philosophy and nature of guidance services, organization and administration of guidance programs, the role of the guidance counselor, and the relationship of guidance services in the total curriculum.

758 *Group Guidance Problems and Practices.* (3) II, S
Providing for the common needs of groups of students in making more effective educational, occupational, social, and personal adjustments. Special emphasis is given to the selection, organization, and effective use of group guidance materials and techniques.

759 *Identifying and Providing for Individual Student Needs.* (3)
Research studies and reports on individual differences in the physical, intellectual, social, and emotional development of students, and of ways that have proved effective in meeting individual needs, especially in secondary schools. To be taken with EDP 755 in First Professional Block of the Counselor Education Program. Not offered separately. *Staff.*

760 *Counseling Theory and Practice.* (3) II, S
A study of the basic theories, principles, and techniques of counseling and their applications to counseling in schools and colleges. Practice in the techniques of interviewing, and the use of psychological tests, observation, records, case studies, and other procedures in the counseling process. Prereq: EDP 755, 756.

761 *Supervised Practice in Counseling.* (3) I, II, S
Supervised practice in counseling in the educational setting in which the student plans to work. Requires 8 hours a week in actual counseling plus a minimum of 2 hours weekly in seminar. Prereq: EDP 755, 756, 760, and at least two hours weekly in seminar. May be repeated to a maximum of nine credits. *Staff.*

762 *Organization and Administration of Guidance Services.* (3)
A study of the problems of supervision, staffing, finances, effective inter-personal relationships, community participation, in-service education and evaluation of the guidance program. Includes supervised experience in the planning and administration of guidance services. Prereq: Master's degree in counseling and guidance.

763 *Research and Evaluation in Guidance.* (3)
Research methodology applied to the evaluation and interpretation of guidance services. May include analysis and interpretation of test data from schools and school systems, emphasizing the application of test data to local school problems and the organization of reports.

764 *Using Occupational and Educational Information in Counseling and Guidance.* (3)
Collection, evaluation, organization, filing and use in counseling of current data. Supply and demand, working conditions, trends, entrance requirements, job families, and career fields. Schools, colleges and other agencies that prepare for advancement in productive careers. To be taken only with PSY 641 in the Second Professional Block of the Counselor Preparation Program. Not offered separately.

765 *Independent Work in Counseling and Guidance.* (2)
An independent work course for advanced graduate students who desire to investigate special problems in counseling and guidance. Prereq: one year of graduate work in Counseling and Guidance, including EDP 755 (or PSY 610), and approval of instructor. May be repeated to a maximum of four credits. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

777 *Seminar in Counseling and Guidance.* (3)
A seminar for advanced graduate students. Designed to develop deeper understandings and clearer insights in guidance and counseling, through critical examination and discussion of pertinent theories, research reports, case records and counseling experiences. Prereq: 36 hours in Counseling and Guidance, including Practicum (EDP 761 or PSY 665), approval of adviser and staff.

782 *Independent Work in Educational Psychology.* (3) I, II, S
An independent work course for students who have done a minimum of 12 semester hours of graduate work including EDP 522, 520, or 658. May be repeated to a maximum of six credits.

HEALTH, PHYSICAL EDUCATION AND RECREATION

The Department of Health, Physical Education, and Recreation offers graduate work toward the Master of Arts or the Master of Science with a major in Physical Education. Candidates may select, subject to the approval of the Department, either of two plans in pursuing their graduate program. Students must submit evidence of good undergraduate preparation in the area. In general, twenty-four hours credit will suffice.

For Plan A, see the general information at the front of this publication.

The modified Plan B has the same minimum requirements as Plan A except that six or more semester hours of course work may be substituted for a thesis and a reading knowledge of a modern foreign language is not required of candidates in the Department. Of the thirty hours of graduate credit indicated

above in the modified Plan B, eight hours must be in a subject-matter area other than Physical Education and Education. At least 15 hours must be in courses numbered 600 or above in Physical Education. The candidate under this plan must also present a major paper approved by his major professor and the director of graduate study as partial fulfillment of his requirements. This major paper may be developed as a part of a particular course requirement, or it may be done as an independent project. A student may follow this plan only with approval of the Department.

Candidates who are not graduates of the University of Kentucky are required to teach under supervision at least one activity class during their residence. The purpose of this regulation is to provide staff members an opportunity to evaluate their teaching and leadership ability.

In order to meet the needs and interests of graduate students, the Department offers specialization in the following areas:

1. Administration of Physical Education
2. Athletics in Education
3. Physical and Health Education
4. Dance in Education

Each area of emphasis is organized around a central core which contains fundamental and basic knowledge generic and essential to all areas. The following core curriculum is, therefore, recommended for graduate students:

741—Current Studies and Trends ..... 3 hrs.
650—Curriculum and Program Development ..... 3 hrs.
770—Seminar ..... 2 hrs.

RECREATION: Students interested in Recreation may choose one of the following options: Outdoor Recreation, Recreation in Rehabilitation and Mental Retardation programs, Commercial Recreation and general agency administration.

Each area of emphasis is organized around a central core which contains fundamental and basic knowledge generic and essential to all areas, including these courses:

583—Interpretation of Leisure and Recreation
685—Administrative Practices
741—Current Studies and Trends
780—Problems in Recreation

For details on the graduate programs of the various areas of specialization, write the Department of Health, Physical Education, and Recreation, Graduate Division.

COURSES FOR MEN AND WOMEN OPEN TO UPPER DIVISION AND GRADUATE STUDENTS

430 *Methods of Teaching Health Education.* (3)
Basic organization and planning of elementary and secondary school health and safety programs for the classroom teacher. Major emphasis on curriculum development and teaching techniques. Prereq: HPR 330.

471 *Outdoor Education Through Camping.* (2)
The theory and practice of the use of camping as an adjunct to the classroom in achieving educational objectives. Prereq: HPR 281 or consent of instructor.

482 *Administration of Intramural Activities.* (2)
To teach the conduct of sports related programs such as intramurals, extramurals, sports clubs and comparable activities; lecture, recitation, and practice in methods of organizing and administering intramurals and other activities. Lecture, one hour; lab, 2 hours per week.

491 *Dance in Education.* (3) II
An introduction to the creative approach to dance for elementary, secondary, and college levels. The principles of kinesthetics and rhythmical forms applied to the practice of fundamental movement techniques. Two hours lecture and four hours laboratory. Prereq: PGY 206, HPR 572, and a beginning course in dance, or consent of instructor. *McCall.*

507 *Driver and Traffic Safety Education.* (3) II, S
Analysis of traffic accidents, attitude factors, essential knowledge of automobile operation and traffic laws and regulations. Laboratory experience is devoted to improvement of the students' driving skill and an understanding of how to structure laboratory lessons in the dual control automobile. *Gardner.*

509 *Workshop in Health and Safety.* (2)
Designed as a short course in current aspects of school health or safety education with emphasis upon the needs of teachers.

520 *Physiology of Exercise.* (3) I, II
A comprehensive survey of the physiological and clinical aspects of exercise. Lectures, demonstrations, three hours. Prereq: ANA 206, and PGY 206, 207, or equivalent; or consent of instructor. *Jokl, Teraslinna.*

530 *Administration of Health and Safety Education.* (3)
Consideration is given to the administration, organization and function of the total school health and safety program. Textbook evaluation and materials suitable for school health and safety instruction will be stressed. The role of schools in public health will be defined.

540 *Organization and Administration of Physical Education.* (3) I, S (odd years)
Policies and procedures of administration on the secondary school and collegiate levels. Special emphasis on construction and care of facilities, equipment, and supervision of personnel. Three hours per week. Prereq: HPR 344 or equivalent. *Clay, Carr.*

541 *Coaching Advanced Basketball.* (2) I, S
Lecture and recitation on the theory and practice of team play in basketball. Special emphasis is placed upon systems of offense and defense. Two hours per week. Prereq: HPR 141, or consent of instructor. *Staff.*

542 *Coaching Advanced Football.* (2) II, S
Lecture and recitation on the theory of football. Special emphasis is placed upon generalship, signal systems, scouting, and conditioning of players. Two hours per week. Prereq: HPR 142, or consent of instructor. *Staff.*

545 *Introduction to Tests and Measurements.* (3) II
The construction and grading of essay and objective tests, construction and analysis of achievement tests, and testing and measuring in health and physical education. Two hours lecture and two hours laboratory per week. *Gruber, Kirkendall, Reece.*

546 *Physical Educational Workshop.* (2)
A concentrated study in a specific sport or activity or field of emphasis in physical education. May be repeated for a maximum of six credits.

547 *Psychology of Sport and Physical Activity.* (3)
Prereq: Undergraduate psychology course accompanied by basic statistics.

570 *Space and Structures for Recreation.* (3)
A survey of standards, legislation regulations, finances for facilities and equipment for recreation. Space and structures required to meet program objectives will be studied.

571 *Therapeutic Recreation.* (4)
A study of the principles and practices involved in recreation in a hospital or institutional setting. This would include types of therapeutic situations, program planning, financing of program opportunities, execution and evaluation. Lecture, three hours; laboratory, two hours.

572 *Kinesology and Its Application.* (3) I
A study of basic principles of bodily movement and their application to sports, rhythmical activities and the correction of functional defects. Three hours lecture and two hours laboratory. Prereq: ANA 206 and PGY 206, 207. *Reece.*

573 *Administration and Organization of Recreation.* (3) II, S
This course is designed to equip students and community leaders with workable procedures for developing and operating recreation programs in communities of various sizes and with varying political and social structures. *Verhoven.*

574 *Principles of Camp Counseling.* (2)
A study of the roles of the camp staff in relation to the growth and development of the camper, including normal and handicapped children, adults, and older persons. Prereq: HPR 370.

575 *Interpretation of Leisure and Recreation.* (3) I, S
Designed to provide students interested in recreation as a profession, as an adjunct to other work, or as informed citizens with a basic understanding of the significance of leisure and the objectives of recreation. *Kauffman, Verhoven.*

576 *Problems of Leadership in Recreation.* (3)
This is similar to the seminar used for students doing practice teaching. The principles of leaders will be analyzed and applied to the functions of recreation leaders. Emphasis will be placed on techniques of communication and decision-making as applied to leisure situations. (Concurrent with HPR 377). For REC majors only. Prereq: HPR 170, 380 *or* 381 *or* 382 and 583.

578 *Seminar in Recreation.* (3)
May be repeated once.

579 *Adapted Physical Education.* (3)
A study of programs of physical education for atypical students, with emphasis upon specific postural faults and other abnormalities commonly found in a school population. To include training and experience in procedures, adapting the physical education program to accommodate these students. Lectures, two hours; laboratory, two hours. Prereq: HPR 343, 572.

592 *Choreography for Groups.* (2)
The building of dances for groups in Ballet, Modern, and Theater dance forms. Lecture, one hour; lab, two hours per week. Prereq: HPR 491. *McCall.*

593 *Dance Production.* (3)
A consideration of the problems of the dance production for audience appreciation. Theory and practical experience in costuming, building scenery, lighting, and make-up. Financial and publicity aspects will be studied. Lecture, two hours; laboratory, four hours. Prereq: HPR 191, 192, 291, 292, 390, 391, 392, 393, 592.

595 *Folk Dance Leadership for School and Community.* (2) S
Philosophy, background and methods of folk dance for schools and communities. Leadership, participation and program planning with special emphasis upon field work with community groups.

COURSES OPEN TO GRADUATE STUDENTS ONLY

609 *Seminar in Health and Safety Education.* (3)
Overview of the problems confronting persons in these fields and selected research findings applicable to these areas. Emphasis is given to gaining a better understanding of research data and to a greater utilization of research findings in both school and community health and safety endeavors. Prereq: HPR 507 or 530.

644 *Research and Its Application.* (3) I, S
The theory and practice of tests and measurements in the field of health and physical education. Two hours lecture and two hours laboratory. *Gruber.*

645 *Advanced Measurement and Evaluation in Health, Physical Education and Recreation.* (3)
Procedures in developing criteria for the validation of tests in health, physical education, and recreation. Laboratory experiences in the administration of tests of metabolic function, biomechanics, motor performance, and health and safety knowledge. Two class hours, two laboratory hours per week. Must be accompanied or preceded by basic statistics and introduction to tests and measures.

646 *Integrated Development.* (3)
An analysis of the literature in the area of integrated development. Emphasis on development of skills in the use of research techniques, materials and resources in investigating potential problems in this area in depth. Prereq: HPR 546 and 643.

650 *Curriculum and Program Development.* (3) I, S (even years)
A study of fundamental principles basic to the development of the over-all curriculum in physical education with special emphasis upon the proper selection and organization of physical education activities to meet the education and recreational needs of all students. Three hours per week. Prereq: HPR 343, 344, 540. *Reece.*

651 *Facilities, Construction, and Equipment.* (2) S
Principles and standards for maintaining facilities, and planning construction; purchase and care of equipment. Prereq: HPR 540. *Seaton.*

685 *Administrative Practices in Recreation.* (3) I, S
A study of administrative practices concerned with policy determination, public relations, personnel practices, and routine details that constitute the functions of the chief recreation officer and his staff associates. Three hours per week. Prereq: HPR 580 or consent of instructor. *Verhoven.*

690 *Organization and Administration of Dance in Education.* (3) II, S (odd years)
Special emphasis is placed upon the organization and administration of the program in dance to meet the needs of students from elementary through college levels. Some attention is given to dance production, festivals and social dance functions in schools. Three hours per week. Prereq: HPR 491, 592, 595. *McCall.*

720 *Sports Medicine.* (3) II, S (even years)
A study of the basic areas covered in sports medicine with readings and discussions of current international trends in the research and practice in this field. Three hours per week. Prereq: Twelve semester hours' credit in the field of biological science and consent of instructor. *Jokl.*

741 *Current Studies and Trends in Health and Physical Education.* (3) I, S (even years)
A study of modern trends in health and physical education and standards of evaluation in relation to the history of the various systems including a review of the principles and objectives. *Seaton, Kirkendall.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

770 *Graduate Seminar in Physical Education.* (2) I, II, S
A review of current literature in the field. Guidance in thesis writing. Two hours per week. May be repeated to a maximum of four credits. *Teraslinna.*

780 *Problems in Recreation.* (2) II, S
Current problems in recreation are identified and analyzed by the application of appropriate recreation techniques. Designed for recreationists, school people, and community workers. *Verhoven.*

782 *Problems in Physical Education.* (3) I, S
For school administrators and directors of physical education. Students work on individual problems applicable to their situation and interests, as well as upon general school problems. *Graduate Faculty.*

783 *Problems in the Administration of Athletics.* (2) II, S
For athletic directors, supervisors, and athletic coaches. A study of representative athletic administration procedures for colleges and public school systems. Business management is also stressed. Two hours per week. *Clay.*

HIGHER AND ADULT EDUCATION

Special Note: The faculty in the Department of Higher and Adult Education is planning a graduate program through the post doctoral level which hopefully will be approved by fall, 1969. The doctoral program will be available to those qualified students who plan careers (major or minor areas) in college administration and teaching. Each major will be encouraged to develop a strong outside minor in his discipline, e.g., history, sociology, psychology, speech.

Basically, the doctoral program will center around four comprehensive seminars, a supervised internship, and selected courses from other departments. There will be limited Master's degree programs in adult education, student personnel, and teaching in the junior college.

New special purpose courses such as The Junior College and Adult Education will be developed to serve those who want to schedule one or two courses. Present courses listed in the Department will be revised. Clinic workshops and post doctoral seminars will be available for the summer session.

99 *Orientation Seminar for Graduate Students.* (0)
An orientation course for students who are entering the Graduate School for the first time.

718 *Trends in Higher Education.* (3)
A survey of modern tendencies in higher education; scope and development, objectives, organization, administration, curricula, finance, faculty and student personnel. Designed primarily for prospective college administrators, teachers, and registrars. *Staff.*

719 *Teaching at the College Level.* (3)
A study of all phases of instruction at the college level. The course will include methods and principles of teaching, utilization of materials in teaching, a consideration of the teaching-learning process as it relates to the individual student, and the evaluation of student progress. A comprehensive course for prospective college teachers.

722 *College Student Personnel.* (3)
A study of college student behavior, relationship of student personnel to total college program, organization and administration, evaluation, and research of college student personnel. Lecture, two hours per week; laboratory, three hours.

733 *Technique and Professional Work of the Registrar.* (3) I, II, S
A comprehensive study of the work of the registrar in institutions of higher education, including the history, literature, and present-day tendencies; rules of the University, recommendations of the American Association of Collegiate Registrars. May be repeated to a maximum of six credits. *Staff.*

734 *The Junior College.* (3)
History, philosophy, programs, and teacher-learning climate at the junior college; patterns of control and support; a consideration of the private as well as the community junior college.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

798 *Seminar in Higher Education.* (3)
A critical study of selected problems in higher education. The seminar topic will be varied from one semester to another. Prereq: EDH 718 and 733.

799 *Research Problems in Higher Education.* (3) I, II, S
An independent research course for the study of special problems in higher education. Prereq: one year of graduate work. May be repeated to a maximum of six credits. *Staff.*

SOCIAL AND PHILOSOPHICAL STUDIES IN EDUCATION

532 *Intergroup Relations.* (3) S
Analysis of relationships between groups which differ in religious, ethnic, or socio-cultural backgrounds; the development of educational and social techniques for reduction of tensions. (Same as SOC 532.) May be repeated to a maximum of six credits. Prereq: SOC 101. *Staff.*

533 *Introduction to the Philosophic Study of Education.* (3)
An introduction to the philosophic analysis of major concepts in education. The course is designed primarily as an elective for students in teacher-education and students in other colleges. Does not apply toward teacher certification. Prereq: Junior or senior status, not on academic probation.

599 *International Studies in American Education.* (3)
Place and purpose of study of other cultures, world problems and relations between nations, in American schools, colleges and universities. Implications of this study for curriculum planning, teaching, and administration of schools, colleges, and universities, and organization of intercultural experiences.

640 *Philosophy of Education.* (3) I, II
An advanced course dealing with the philosophy of democratic education and applications to some of the larger educational problems of today. Prereq: 12 semester hours in education. May be repeated to a maximum of six credits.

645 *Foundations in Education.* (3) I, S
An intensive study in various foundational fields which contribute to the development of educational theory and practice. May be repeated to a maximum of six credits. Prereq: 12 semester hours in education at undergraduate level.

646 *Analysis of Thinking.* (3)
An interdisciplinary analysis of thinking, the central process of education. Topics studied include psychological, logical and semantic aspects of thought. Prereq: EDP 548 and EDF 640 or permission of instructor.

650 *History of Western Education.* (3)
A study of the development of the "institution" of education in relation to social and political reality, ideas, and ideals of successive periods in Western culture.

651 *History of Education in the United States.* (3)
A history of the growth and development of education in the United States from earliest Colonial times to the present, including recent movements and trends. ***Hartford.***

652 *History of Educational Thought.* (3) I, S
A study of the lives and writings of the world's great educators to acquaint the student with their major contributions to society and education.

655 *Education in Other Nations.* (3)
Analytical and comparative study of contemporary education in selected countries, with emphasis on the historical development and total cultural context of educational programs. Informal as well as formal agencies and programs will be studied with particular attention to recent reforms and innovations.

656 *International Development Education.* (3)
Critical study of the role of education in the social, cultural, political and economic development of countries in Asia, Latin America, and Africa with particular emphasis on interdisciplinary-interprofessional planning. Problems of change in education and international cooperation for educational development.

661 *Educational Sociology.* (3) II, S
A course in sociological foundations of education. (Same as SOC 661.) Prereq: SOC 101.

662 *Analysis of Educational Change.* (3)
The history, nature, processes, and problems related to educational change, drawing upon the literature in several disciplines.

663 *Field Research in Educational Change.* (3)
A field study of a particular problem relating to educational change will be made, using appropriate conceptual strategies and procedures. Prereq: EDF 662.

724 *Epistemological Problems in Education.* (3)
A study of knowledge and inquiry as they relate to problems of formulating educational policy and curriculum design. Prereq: EDF 640.

725 *Analysis of Value Questions in Education.* (3)
A study of the nature of value as it relates to formulating and justifying aims and policies, curriculum design and the teaching-learning process. Materials in ethics, value theory, and aesthetics are used in the appraisal of educational theory. Prereq: EDF 640 or equivalent.

750 *Problems in Educational Sociology.* (3) S
An advanced course in the application of sociological findings to education including consideration of Southern regional problems and potentialities. Prereq: 12 semester hours of graduate work including EDF 661 or equivalent; SOC 101. (Same as SOC 750.)

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

773 *Seminar in Foundations of Education.* (3) S
A critical study of selected problems in the foundations of education areas.

778 *Seminar in History of Education in Kentucky.* (3) II, S
A seminar for graduate students in education who are interested in developing a background and perspective upon educational problems by study of the history and development of education in Kentucky.

785 *Independent Study in Social and Philosophical Problems in Education.* (3)
This course will allow advanced students to study, in depth, individualized problems and issues related to social and philosophical foundations. May be repeated to a maximum of nine hours. Prereq: EDF 661 or its equivalent.

SPECIAL EDUCATION

500 *Speech Analysis and Perception.* (3) I
Physics of sound; acoustic and structural properties of speech and their relationship to speech perception; analysis of speech intensity, fundamental frequency, wave composition, and time (rate, duration, and transitional change). (Same as SP 500.)

501 *Speech and Language Development.* (3) II
The normative aspects of speech and language acquisition; application of linguistic and learning theory concepts; communication in lower animals; language and cognition.

505 *Education of the Trainable Mentally Retarded.* (3) II, S
A study of modern classroom techniques for working with the trainable, or severely mentally retarded. Private and public day and residential school programs are considered. Attention is given to educational significance of multiple disabilities of retarded children.

525 *Education of the Orthopedically and Neurologically Handicapped.* (3)
A study of educational techniques, materials, and equipment used in teaching crippled, brain-injured and chronically ill children. Curriculum for both classroom and individual clinical teaching is included.

526 *Education of the Educable Mentally Retarded.* (3)
A study of modern classroom techniques for working with the educable, or mildly mentally retarded. Major emphasis is on curriculum development and teaching techniques.

527 *Survey of Physical and Neurological Defects.* (3)
A survey of causes, treatment, and educational implications of physical and neurological disabilities in school age children. Attention given to rehabilitation and life adjustment problems of individuals with single and multiple handicaps.

530 *The Nature and Needs of Retarded Children.* (3) I, II, S

A critical examination of pertinent research in reference to the educational, physical, and psychological nature and needs of the educable and trainable mentally retarded child, including interpretation of psychological tests. Evaluation of the physical, social, emotional and mental characteristics of the retarded, to assist the classroom teacher to recognize the social potential of each child to the degree that the child with retarded mental development may become less of a burden to himself and society.

558 *Modern Educational Problems: Education of Handicapped Children.* (3)

Procedures to be used in the education of children who are handicapped physically, mentally, or emotionally. Attention is given to work with individual children as well as with groups.

570 *Characteristics of Emotionally Disturbed Children.* (3)

The problems of emotionally disturbed school children are considered in the context of normal child development with emphasis on psychological factors correlated with behavior deviations. A survey of the major diagnostic categories include identification, description, and etiology, with material drawn from clinical, theoretical and research sources. Approaches to remediation cover both community resources and the roles of various professional personnel. Lecture, 2 hrs.; lab, 2 hrs. Prereq: EDS 375 or permission of instructor.

577 *Speech Pathology: A Survey.* (3) I, S

An introduction to the nature, causes, and treatment of the major disorders of speech: articulation, voice, cleft palate, hearing, cerebral palsy and aphasia.

578 *Speech Pathology: An Introduction to Therapy.* (3) II, S

Observation and discussion of and limited supervised experience with therapeutic techniques and procedures of speech therapy. Prereq: EDS 577.

579 *Stuttering.* (3) II

The nature, causes, and treatment of stuttering, with emphasis on therapeutic procedures. Prereq: EDS 577. (Same as PSY 579.)

583 *Speech Mechanisms.* (3) I

A detailed investigation of the speech musculature: respiration, phonation, resonation, and articulation. Voice disorders and cleft palate will be given special emphasis. Prereq: EDS 577.

584 *Introduction to Clinical Audiology.* (3) I

Topics covered are the auditory stimulus, air and bone conduction thresholds, masking, speech audiometry and auditory rehabilitation. Prereq: EDS 577.

587 *Audiometry.* (3) II, S

Methods and techniques for evaluating the hearing of large samples (school children, industry). Study of test instruments, calibration and variables in testing procedures. Essentials of hearing conservation. Prereq: EDS 577 or consent of instructor.

591 *Advanced Clinical Methods for the Aurally Handicapped.* (3) II, S

Principles and methods of speech and hearing therapy including speech reading, auditory training, speech conservation and hearing aid counseling for children and adults. Prereq: EDS 584.

592 *Introduction to Hearing Disorders.* (3) I

Types of hearing loss. Classification of organic hearing disorders. Nonorganic hearing disorders. Psychological effects of impaired hearing. Differential diagnosis. Prereq: EDS 584.

601 *Behavioral Management of Exceptional Children.* (3)
Principles of behavioral management are reviewed. Techniques of observation, recording, and implementation of management programs with exceptional children are stressed through casework with individuals and groups of children. Lecture, 2 hrs; lab, 2 hrs. Prereq: Consent of instructor.

610 *Educational Evaluation of Exceptional Children.* (3) I
An intensive study of, and laboratory experience in, the assessment of educational problems of exceptional children. Special emphasis is given to the relationship of physical, intellectual, emotional and social handicaps to performance in the individual or group setting. Class hours per week, 2; lab hours per week, 2. Prereq: EDP 522 and consent of instructor.

611 *Educational Remediation of Learning Disabilities of Exceptional Children.* (3) II
The study of, and laboratory experience in, the remediation of educational problems of exceptional children. Attention is given to the amelioration of learning disabilities in individual cases. Class hours per week, 2; lab hours per week, 2. Prereq: EDS 610 or consent of instructor.

613 *Articulation and Articulation Disorders.* (3) II
Research and clinical findings on articulation and articulation disorders. Topics include articulation testing and prediction, variables related to articulation performance and articulation programming (therapy). Three class hours per week.

614 *Voice and Voice Disorders.* (3) I
Research on voice and voice disorders. Topics include a review of voice physiology and organic and functional voice disorders. Three class hours per week.

617 *Cleft Palate and Cerebral Palsy.* (3) I
Description, assessment and interdisciplinary management of organic speech disorders, particularly those associated with orofacial anomalies and dysarthria. Review of relevant research. Three class hours per week.

627 *Practicum in Speech Therapy.* (3) I, II, S
Practical case work in speech therapy in speech clinic, hospitals, and public schools. Training in diagnostic examination, case history methods, and group therapy. Prereq: EDS 577, 578. May be repeated for a maximum of 6 credits.

647 *Disorders of Language.* (3) II
Emphasis on adult aphasia and developmental language disabilities, theories, research findings, assessment procedures, and therapy approaches. Three class hours per week. (Same as PSY 647.)

671 *Education of Emotionally Disturbed Children.* (3)
A study of educational techniques, materials, and equipment used in teaching emotionally disturbed children. Curriculum for both classroom and individual clinical teaching is included. Lecture, 2 hrs; lab, 2 hrs. Prereq: EDS 570.

672 *Theories of Educating Emotionally Disturbed Children.* (3)
A systematic review of various teaching philosophies related to the education of emotionally disturbed children. Observation and participation in educational settings reflecting these philosophies will be provided. Lecture, 2 hrs; lab, 2 hrs. Prereq: Consent of instructor.

702 *Seminar in Speech Pathology.* (3)
Advanced coverage of the clinical and research literature on the etiology, description, assessment, and management of specific speech and language disabilities. The semester topic will be rotated. Topics will include stuttering, developmental language disabilities, cleft palate, cerebral palsy, etc. May be repeated twice for a maximum of 9 hours.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely.

770 *Seminar in Education of Exceptional Children.* (3) I, II, S
Study of philosophy, principles, trends, and research in education of exceptional children. Students will carry on an extensive study of a problem dealing with education of the exceptional child.

VOCATIONAL EDUCATION

AGRICULTURAL EDUCATION

580 *Teaching Vocational Agriculture.* (15) I, II
Preparation for teaching of agriculture. About one-half of the course is practice. ***Binkley, Bruce, Bayer, and supervising teachers.***

581 *Adult-Farmer Schools and Young-Farmer Courses in Agriculture.* (3) I, II
A general introduction to adult-farmer schools and young-farmer courses with some observation of work in both of these fields. ***Binkley, Cox, and supervising teachers.***

582 *Problems in Agricultural Education.* (3) I, II, S
Class work on current problems in agricultural education common to special groups of students (not individual-problems work). (May be repeated once to a maximum of 6 credits.) ***Binkley and Staff.***

585 *Farm Practice Supervision.* (1) I, II, S
Practice and directed study in supervising farming programs in vocational agriculture. ***Binkley.***

670 *Method of Teaching Vocational Education.* (3) S
The principles of method applied to teaching in the field of vocational education. Prereq: experience in teaching vocational education. ***Binkley.***

671 *Teaching Prevocational Agriculture.* (3)
Aims, purposes, and methods of teaching prevocational agriculture. Each student works out the content of a course, including selecting the teaching materials. ***Staff.***

672 *Determining Content in Vocational Agriculture.* (3) S
Interpretation of local data as a basis for course building. Each student works out the content of a four-year course in vocational agriculture. ***Bruce and Luster.***

675 *Modern Problems in Agricultural Education.* (3) I, II, S
Class work (not individual-problem work) on modern problems in agricultural education. May be repeated to a maximum of nine credits. ***Binkley.***

677 *Advanced Problems in Agricultural Education.* (3) I, II, S
Specific problems selected according to the needs of the individuals. ***Staff.***

678 *Selecting Teaching Materials.* (3) S
Selection of specific references and other teaching materials to be used in the teaching of vocational agriculture. ***Luster and Bruce.***

679 *Adult-Farmer Schools.* (3) S
Preparation for teaching adult farmers; organization of adult-farmer schools, curriculum content, method of teaching, and follow-up work. ***Bruce and Cox.***

680 *Directing Farm Practice.* (3) S
Supervised farming as a method of teaching; standards, planning, supervision, and records. *Binkley.*

681 *Teaching Farm Shop.* (3) S
A study of necessary content for shop, plans for securing and equipping the shop, and methods of teaching farm shop. *Cox.*

682 *Young-Farmer Schools.* (3) S
Content and method of teaching young-farmer courses in vocational agriculture. *Cox.*

795 *Research Problems in Agricultural Education.* (3) I, II, S
A continuation of EDV 794. May be repeated twice to a maximum of nine credits. *Staff.*

BUSINESS EDUCATION

511 *Teaching Secretarial Subjects.* (3)
A study of effective teaching in shorthand, transcription, business communication, and secretarial office practice.

512 *Teaching Bookkeeping and Accounting.* (3) I, S
Methods, materials, and techniques used in the teaching of bookkeeping and accounting. Required of business education majors. *Musselman.*

513 *Teaching Typewriting and Clerical Practice.* (3)
A study of effective teaching in typewriting and clerical office practice including the machines commonly used in business offices.

514 *Teaching General Business Subjects in the Secondary Schools.* (3) S
The aims and purposes of the general business course are studied. Analysis is made of the objectives of the general subjects, and methods and materials used in teaching them are emphasized. *Musselman.*

605 *Teaching Consumer Courses in the High School.* (3) I, S
Methods, materials and techniques of teaching high school pupils the various aspects of consumer education. Emphasis is placed on procedures and the student should have a background of training in economics before taking the course. *Musselman.*

615 *Problems in Business Education.* (3) I, II, S
A study of advanced problems of interest to business teachers such as testing in business subjects, guidance, job studies, placement and follow-up, equipment, and supervision. May be repeated three times to a maximum of 12 credits. *Musselman, and Dickinson.*

618 *The Social Business Subjects in High School.* (3) I
An examination of the various social business subjects to determine their contribution to the objectives of business education. *Musselman.*

621 *The Business Curriculum.* (3) II, S
A study of business subjects offered in the high school to determine their content and the place each should occupy in high school curricula. A course of study is developed for each subject. *Musselman.*

622 *Business Education in Colleges and Universities.* (3) S
Consideration of the problems pertaining to the teaching of business subjects at the college level. Consideration is also given to the development of curricula to meet teacher certification requirements in various states. *Musselman and Dickinson.*

623 *Administration and Supervision of Business Education.* (3) II, S
Duties and responsibilities of city and state supervisors, department heads, and others engaged in directing business education. *Musselman and Dickinson.*

626 *Classification and Possible Use of Community Resources in Business Education.* (3) I

Course provides for community analysis, and the development of possible ways and means to supplement the business education course in the secondary school with a study of vital community resources. *Musselman.*

774 *Seminar in Business Education.* (1) I, II, S

A study of current literature in business education with special reference to trends in this field. May be repeated once to a maximum of two credits. *Musselman and Dickinson.*

786 *Independent Work in Business Education.* (3) I, II, S

An independent work course for students who have done a minimum of 12 semester hours of graduate work, one-half of which must have been in business education. May be repeated once to a maximum of six credits. *Musselman and Dickinson.*

BUSINESS AND OFFICE EDUCATION

445 *Office Administration and Services.* (3)

A study of the theory, principles, and techniques of modern office administration and services with emphasis on data processing systems and information handling.

519 *Records Management.* (3)

Underlying principles and procedures of records management; information storage and retrieval systems; integration and control of records systems and programs. Lecture, three class hours per week. Prereq: BOE 219 or consent of instructor.

556 *Business Research Reports.* (3)

Current problems in selected interest areas investigated by various research procedures with major emphasis placed upon sources of data, compilation and arrangement of data, documentation, bibliography, and effective presentation. Prereq: BOE 117 or its equivalent.

DISTRIBUTIVE EDUCATION

515 *Problems in Distributive Education.* (2) I, II, S

Problems in teaching vocational distributive education in day, part-time, and evening schools. The problems are selected in accordance with the needs and desires of the students. May be repeated to a maximum of six credits.

516 *Problems of the Coordinator in Industrial and Distributive Education.* (2) I, II, S

A course for coordinators of Industrial and Distributive Education, including planning of local programs, use of advisory committees, selection and arrangement of teaching materials and over-all planning and operation of the program. May be repeated once to a maximum of four credits.

517 *Determining Teaching Content in Distributive Education.* (2) I, II, S

Course construction in the field of distributive education. This course is planned to meet the needs of persons engaged as instructors in the field of distributive education. May be repeated to a maximum of six credits.

528 *Technique of Teaching Distributive Education.* (2) I, II, S

A study of the methods of teaching as applied to distributive education. The purpose of the course is to train prospective teachers to teach in the field of distributive education. May be repeated to a maximum of six credits.

HOME ECONOMICS EDUCATION

586 *Technique of Teaching Home Economics.* (3) I, II
A study of methods of teaching as applied to home economics. Prereq: HE 227, 261; EDP 202.

588 *Adult Education in Home Economics.* (3) I, II, S
Problems in teaching vocational homemaking in day, part-time, and evening schools. Prereq: EDV 586; Concur: EDV 362.

590 *Problems in Home Economics Education.* (3) S
Problems in teaching home economics for high school students and adults. May be repeated twice to a maximum of nine credits.

683 *Current Problems in Home Economics Education.* (3) II, S
Recent developments in home economics education. Prereq: EDV 586 and 362; teaching experience.

684 *Modern Trends in Home Economics Education.* (3) I, S
A basic course for students in home economics education. The course includes the development of home economics education and modern trends in curriculum, methods of teaching, and evaluation.

685 *Home Economics Curriculum Construction.* (3) S
A study of the underlying principles of curriculum building for junior and senior high school and adult education in home economics. Prereq: EDV 586 and 362.

686 *Evaluation in Home Economics Education.* (3) I, S
A course to acquaint teachers of home economics with techniques used in measuring attainment in home economics in the junior and senior high school and college. Prereq: teaching experience.

687 *Home Economics Supervision.* (3) I, S
A course planned primarily to help prepare teacher-trainers and supervisors of home economics education. Prereq: EDV 586 and 362; experience in teaching; approval of instructor.

775 *Seminar in Home Economics Education.* (3) I, II, S
Individual investigations and reports on special problems in home economics education. May be repeated twice to a maximum of nine credits.

787 *Independent Work in Home Economics Education.* (3) I, II, S
An independent work course for students who have done at least 12 semester hours of graduate work, one course of which must have been in home economics education. May be repeated once to a maximum of six credits.

INDUSTRIAL EDUCATION

518 *Methods in Industrial Education.* (2) I, II, S
The most approved methods in instructional management, including lesson planning, in the field of vocational industrial education. May be repeated once to a maximum of four credits.

524 *Modern Industrial Analysis.* (2) I, II, S
Modern industrial organizations; trends in industrial educational policies; the proper approach to and analysis of these problems as they affect the industrial vocational teacher.

529 *Evaluation in Industrial and Distributive Education.* (2) I, II, S
The theory and practice of standardized, classroom, and performance testing as a means of measuring student achievement. Opportunity to practice will be provided in keeping with each teacher's work assignment. Prereq: Must be employed as teacher in Trade or Distributive Education.

534 *Organization and Operation of Part-Time and Evening Classes.* (2) I, II, S

A course for administrators, coordinators, and teachers in part-time and evening industrial education. Covers the duties of a coordinator in cooperative training programs.

535 *Principles and Philosophy of Industrial Education.* (2) I, II, S

A course planned primarily for the advanced student in industrial education. It covers the general philosophy of vocational education as it relates to the problems and principles of industrial education. May be repeated once to a maximum of four credits.

536 *Surveys in Industrial Education.* (2) I, II, S

This course deals with the basic methods and techniques used in making a survey to determine the needs for trade and industrial education. Emphasis is placed on gathering, evaluating, and interpreting the data.

537 *Special Problems in Industrial Education.* (2) I, II, S

The supervised study of approved problems in industrial education on a research basis.

VOCATIONAL EDUCATION

523 *Vocational Guidance.* (2-3) I, II, S

A study of the philosophy of guidance, aims and purposes of vocational guidance, individual student inventory (as revealed by tests, surveys, records, case studies, interviews, and observations), and counseling techniques. Emphasis is given to securing and using occupational information, student guidance, placement, evaluation of occupational performance, and organizing and administering vocational guidance programs.

693 *Supervision in Vocational Education.* (3)

This course includes practice in teaching for observation by others, student teaching, and school visiting. Prereq: Two years of teaching experience and EDV 687.

694 *The Administration of Vocational Education.* (3)

A course designed for superintendents, high-school principals, and other administrators. Its purpose is to train for administering and supervising vocational education in schools.

695 *Special Problems in Vocational Education.* (3) I, II, S

An independent work course for students interested in vocational education. Students make individual investigations and report on special problems. *Binkley and Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely.

776 *Seminar in Vocational Education.* (2) I, II, S

A critical study of selected problems in vocational education. The course is open only to students with experience in the field. May be repeated once to a maximum of 4 credits.

794 *Research in Vocational Education.* (3) I, II, S

Individual problems of importance to vocational education.

V. ENGINEERING

Requirements for Advanced Degrees in Engineering

(See also pages 15-23.)

THE MASTERS' DEGREES IN ENGINEERING. The masters' degrees in engineering may be obtained by satisfying the following requirements:

1. Twenty-four semester hours in graduate courses with an average standing of 3.0 or better.
2. An acceptable thesis.
   (With departmental approval, a student may substitute six credits of graduate level course work for the thesis.)
3. Two-thirds of the work must be in the major subject.
4. There is no language requirement for these degrees.

The candidate must hold the corresponding Bachelor of Science degree in engineering or the equivalent from this institution or from another engineering school of recognized standing. A thorough working knowledge of chemistry, physics, and mathematics is necessary. The degrees offered are Master of Science in Agricultural Engineering, Master of Science in Chemical Engineering, Master of Science in Civil Engineering, Master of Science in Electrical Engineering, Master of Science in Engineering Mechanics, Master of Science (major in Engineering Mechanics), Master of Science in Mechanical Engineering, Master of Science in Metallurgical Engineering, Master of Science in Nuclear Engineering.

REQUIREMENTS FOR THE PH.D. DEGREE

Doctoral work is offered in Agricultural Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Engineering Mechanics, Mechanical Engineering, and Metallurgical Engineering and Materials Science. See the general requirements for the degree of Doctor of Philosophy as listed on page 24 of this bulletin.

One modern foreign language is required for the Ph.D. degree in Engineering.

AGRICULTURAL ENGINEERING

The agricultural engineering graduate program has as its objectives the development of:

1. The ability to plan and conduct research and design involving the application of the engineering laws to biological and agricultural systems.
2. The understanding of the mathematical, physical, and biological sciences to permit the reading and understanding of the present and future literature in these related fields.

3. The skills required to use precision instruments, techniques and computers useful in agricultural research and design.
4. The ability to teach college level courses in agricultural engineering, particularly at the doctoral level.

In the attainment of the above objectives the graduate student will combine courses in agricultural engineering, the physical sciences, other engineering fields, and the biological sciences in developing his program of study. The advanced degrees, however, are primarily research degrees awarded for significant creative research or design accomplishment, not for the completion of a specified number of courses. Therefore, the program concentrates on a strong thesis or dissertation problem done under the supervision of the graduate faculty of the department. This does not mean that the course program is not important. Strong course support is essential if the thesis or dissertation problem is to be properly undertaken and completed.

COURSES FOR AGRICULTURAL STUDENTS

400 *Farmstead Planning and Mechanization.* (3) I

Analysis of systems for handling of feed, water, and waste products in agriculture. The processing and storage of farm products. Farmstead layout and design. Structural and environmental design. Lecture, two hours; laboratory, two hours. Prereq: Junior standing or consent of instructor. *Walker, White.*

410 *Farm Power and Machinery.* (3) S

A study of farm tractors and implements. Operating principles of valves, carburetion, ignition, and lubrication of the engine. Use and care of selected tractor-mounted implements. Emphasis on maintenance. Class and laboratory work on tractors and implements. Lecture, two hours; laboratory, two hours. *Young.*

430 *Farm Water Management.* (3) I

Elementary surveying, mapping, and determination of land areas; consideration of precipitation, runoff, and soil erosion relationships; planning terraces, waterways, drainage systems, farm reservoirs, pond water treatment and irrigation systems. Lecture, two hours; lab, three hours. *Brooks.*

450 *Special Problems.* (1-3) I, II, S

An intensive study of some phases of Agricultural Engineering in which the student is particularly interested. Approval of the instructor is required. May be repeated to a maximum of six credits. *Staff.*

506 *Greenhouse Design, Management, and Environmental Control.* (3)

Functional requirements of a greenhouse and the physical laws influencing these requirements. The influence of structural, physical, and biological factors on the environmental conditions will be emphasized. (Same as HOR 506). Lecture, two hours; lab, two hours. Prereq: HOR 512 and consent of instructor. *Walker.*

COURSES FOR ENGINEERING STUDENTS

405 *Properties of Soils and Biological Materials as Related to Engineering.* (3) I

A study of the properties of soil and biological materials which are needed in the engineering design of systems to produce, store, and process agricultural products. Lecture, two hours; lab, two hours. Prereq: Junior standing in Agricultural Engineering or consent of instructor. *Ross.*

406 *Environment for Plants and Animals as Related to Engineering.* (3) II

A study of the thermal, moisture, light, and gaseous components of plant and animal environment with emphasis on interactions between these biological systems and their environment. Lecture, two hours; lab, two hours. Prereq: AEN 405 or consent of instructor. *Walker.*

417 *Energy Sources and Machinery for Agriculture.* (3) I

The use of fundamental concepts of energy and materials in analytical and experimental approaches to the development and design of energy converters and machinery for agriculture. Lecture, two hours; lab, two hours. Prereq: Senior standing in Engineering or consent of instructor. *Smith.*

427 *Functional Design of Agricultural Structures.* (3) II

Functional requirements of farm buildings and structures; planning for plant and process efficiency; selection and utilization of environmental control equipment and structural materials; preparation of plans and design. Lecture, two hours; lab, two hours. Prereq: AEN 406, ME 220, MET 301. *Walker.*

437 *Design of Engineering Systems for Soil and Water Management.* (4) I

Application of engineering principles to the management of surface and soil water for agricultural production. Surveying and mapping for the layout of water control facilities. Design and construction of facilities for runoff and erosion control, water storage, drainage, and irrigation. Lecture, two hours, lab, four hours. Prereq: ME 330. *Haan.*

447 *Agricultural Processing and Electrification.* (3) II

Application of engineering principles to the processing and storage of agricultural products. The utilization of electricity in agriculture. Instrumentation and control of agricultural processes. Analysis of processing systems. Lecture, two hours, lab, two hours. Prereq: AEN 406, EE 305, ME 330. *White.*

505 *Engineering Analysis.* (3) II

A study of the professional method of dealing with engineering problems and the application of this method to problems encountered in the agricultural industry. Lecture, two hours; lab, two hours. Prereq: Senior standing or consent of instructor. *Smith.*

519 *Plant, soil and Machinery Relationships.* (3) I, II

Advanced concepts in the use of biological and soil parameters in the design of machinery for agriculture and agriculturally related industries. Lecture, two hours; lab, two hours.

525 *Environmental Design for Biological Systems.* (3) I, II

The influence of environmental factors on biological efficiency, design and selection of equipment and controls for providing environmental requirements of biological systems. Lecture, two hours, lab, two hours. Prereq: AEN 427 or consent of instructor. *Walker.*

535 *Soil and Water Conservation Engineering.* (3) I, II

Consideration of elements of hydrology related to agriculture; functional analysis, economic analysis and design of more complex systems for soil and water control and management. Lecture, three hours. Prereq: AEN 437 or consent of instructor. *Haan.*

548 *Advanced Agricultural Processing.* (3) I, II

Analytical study of engineering problems dealing with the handling and processing of agricultural products, such as grading, sorting, drying, and curing and the preparation of plans for these operations. To be offered as a formal class or as a special problems course. Lecture, two hours; lab, two hours. Prereq: AEN 447. *White.*

606 *Micrometeorology.* (3)

A study of the processes occurring at the earth-atmosphere boundary, including heat and energy balance, which are important to biological systems. Lecture, three class hours per week. Prereq: STA 521 or STA 523, one course in Thermodynamics, or consent of instructor.

618 *Advanced Plant, Soil, and Machinery Relationships.* (3) I, II
A consideration of fundamental concepts of energy and materials in the identification and mensuration of parameters needed in the development of new machines for agriculture. Lecture, two hours; lab, two hours. Prereq: AEN 417 and 505. *Smith.*

628 *Advanced Design of Structures for Biological Systems.* (3) I, II
The use of similitude, dimensional analysis, and statistical theory in the analysis of selected agricultural structural problems. The prediction of system performance as environmental conditions change; and the analysis of system reliability. Lecture, two hours; lab, two hours. Prereq: AEN 525 or consent of instructor. *Walker.*

635 *Advanced Soil and Water Conservation Engineering.* (3) I, II
A consideration of advanced techniques useful in research, analysis, and design related to soil and water conservation facilities. Mathematical and statistical techniques and theory of models are included. Lecture, three hours. Prereq: AEN 535 or consent of instructor. *Haan.*

645 *Electromagnetic Radiation in Agricultural Engineering.* (3) I, II
An advanced study of the theory and engineering aspects of electromagnetic radiation as applied to the Agricultural Sciences. Consideration is given to the ultraviolet, visible, infrared and radiofrequency types of electromagnetic radiation. Lecture, three hours. Prereq: AEN 548 or consent of instructor. *White.*

648 *Energy and Mass Transfer in Agricultural Processing.* (3) I, II
A comprehensive and in depth study of the principles of energy and mass transfer as they apply to the processing of agricultural and biological materials. Lecture, three hours. Prereq: AEN 548 or consent of instructor. *Ross.*

658 *Instrumentation in Agricultural Engineering Research.* (3) I, II
The principles and applications of measuring instruments and devices for obtaining experimental data. Lecture, three hours. Prereq: Consent of instructor. *Staff.*

660 *Similitude in Engineering.* (3) II
An advanced approach to engineering problems through the theory of similitude and its application to models. The use of geometrically similar, distorted, and dissimilar models will be discussed. Lecture, three hours. Prereq: Graduate standing. *Smith.*

750 *Special Problems in Agricultural Engineering.* (1-3) I, II, S
Independent work on selected research problems in one of the various fields of Agricultural Engineering. Consultation and laboratory by appointment. Prereq: Approval of Department Chairman.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

775 *Seminar.* (0) I, II, S
Weekly meetings with members of the staff for reports and discussions on research and current trends and practices in agricultural engineering. One class hour. May be repeated twice. *Staff.*

795 *Thesis* (0) I, II
May be repeated twice.

BIOMEDICAL ENGINEERING

Under the asuspices of the Colleges of Engineering and Medicine, the University offers graduate training in Biomedical Engineering. The program is operated by a committee, representing both colleges, which is appointed by the Dean of the Graduate School. Doctoral programs are available in the areas of physiology and biophysics, electrical engineering, mechanical engineering, chemical engineering, and metallurgical engineering and materials science.

Research programs now underway include the study of pyhsiological and behavioral responses to environmental stress (*i.e.*, acceleration, rotation, etc.), characteristics and modeling of biological tissue and systems, development of instrumentation for biological monitoring, and related problems. Research is conducted in the laboratories of the Medical Center and the College of Engineering. Coordination of the program is facilitated by the proximity of the two colleges.

Students participating in the biomedical engineering program are enrolled in the department of their major interest. Further information may be obtained by writing to the Director of Graduate Studies in the student's area or to the Chairman of the Biomedical Engineering Program.

CHEMICAL ENGINEERING

The Department of Chemical Engineering provides programs leading to the M.S. in Chemical Engineering and Ph.D. degrees. For the M.S. in Chemical Engineering, 24 hours of coursework plus an acceptable thesis are required. In certain exceptional cases, the thesis may be replaced by six additional hours of coursework. There is no language requirement for the M.S. in Chemical Engineering. For the Ph.D., a reading knowledge of German or Russian is required.

The doctoral student may specialize in one or more of the following areas:

atmospheric pollution control
biomedical mass transfer and kinetics
electrochemical engineering
transfer processes
non-Newtonian fluid mechanics
process control
environmental engineering
chemical reactor design
thermodynamics

A wide selection of thesis topics is available, under the direction of the Chemical Engineering Faculty. For further information on financial aid, requirements, and departmental laboratories and facilities, contact the Department Chairman.

422 *Mass Transfer.* (3) II
Fundamentals of diffusional and convective transport operations with applications to distillation, absorption, extraction, and air-water contact operations. Prereq: ME 330 and/or concur: ME 325.

430 *Advanced Problems in Chemical Engineering.* (2) I

Lecture and problems presenting fundamental principles and design procedures for several selected operations from the broad areas of mass, momentum, and heat transfer. Prereq: CME 422.

431 *Chemical Engineering Laboratory I.* (1) I

Quantitative study of fluid flow, heat transfer, evaporation, etc., comparing the operation of actual equipment with theory. Special consideration of instruments, measurement techniques and report writing. Lab, 4 hours. Prereq: CME 422.

432 *Chemical Engineering Laboratory II.* (2) II

Continuation of CME 431, covering diffusional operations such as distillation, absorption, and drying. Lab, six hours. Prereq: CME 422, 431.

455 *Chemical Engineering Process Design.* (4) II

A lecture and problem course dealing with the application of engineering fundamentals and applied economics to the analysis and design of chemical process systems. Lecture, 3 hours; lab, 3 hours. Prereq: CHE 442, ME 325, CME 422.

505 *Analysis of Chemical Engineering Problems.* (3) I

The application of numerical methods, differential equations, and transforms to complex chemical engineering problems. Prereq: MA 432 or consent of instructor.

515 *Air Pollution Control.* (3)

Kinetics and equilibria of photochemical and "dark" atmospheric reactions. Atmospheric statics and dynamics including lapse rates, inversions, and vertical and horizontal air motion. Single and area source diffusion. Stack meteorology. Prereq: CME 220 or ME 220.

520 *Equilibrium Thermodynamics.* (3) I

A detailed study of the criteria for physical and chemical equilibria, including: predictive equations, solution theory, chemical activity, and external constraints. Prereq: CHE 442, CME 220 or ME 321, or consent of instructor.

530 *Transport I.* (3) I

A unified study of physical rate processes in liquids and vapors, including: mass, energy, and momentum transport, transport in chemically reacting systems, and similarities.

550 *Chemical Reactor Design.* (3) I

A lecture and problem course dealing with interpretation of kinetic data and application in the design of chemical reactor systems. Prereq: CME 220 or ME 321.

562 *Process Control.* (3) I

The theory of automatic control devices and their application in industrial chemical plants. Lecture, 2 hours; lab, 3 hours. Prereq: consent of instructor.

565 *Petroleum Refinery Engineering.* (3)

Application of chemical engineering fundamentals to petroleum processing methods and equipment. Prereq: CME 422 or equivalent and consent of instructor.

615 *Advanced Air Pollution Control.* (3)

Principles and techniques of the control of atmospheric pollution, including process design for the removal of gaseous and particulate pollutants from air streams. Legal and administrative aspects of control. Prereq: CME 515 or consent of instructor.

617 *Air Sampling and Analysis.* (3)

Theory and techniques of air sampling, including aerosal sampling. Instrumental, gravimetric, and volumetric analysis of gaseous and particulate air pollutants with emphasis on the most modern methods of instrumental analysis. Two class hours per week; lab, three hours per week. Prereq: Concurrent with CME 515 or consent of instructor.

619 *Community Health Aspects of Air Pollution Control.* (3)
Effects of specific air pollutants such as sulfur dioxide, particulates, and "smog" constituents on humans, materials, and on the environment. Solid waste disposal by incineration. Air pollution control and water pollution control interrelationships. Prereq: CME 515 or consent of instructor.

621 *Nonequilibrium Thermodynamics.* (3) II
An introductory course in the thermodynamics of irreversible processes, including: phenomenological equations relating flows and forces, Onsager's law, and entropy production in continuous processes. Prereq: CME 520, or ME 620, or consent of instructor.

625 *Properties of Gases and Liquids.* (3)
Development, discussion and application of intermolecular force laws as they apply to gases, liquids and mixtures: Chapman-Enskog kinetic theory, virial theorum, Buckingham (6-exp) potential, and theoretical and semi-theoretical predictive equations. Prereq: CME 520 and CME 530 or consent of instructor.

631 *Transport II.* (3) II
A continuation of Transport I. Interphase transport of mass, energy, and momentum is discussed. Boundary Layer theory is applied to combined transport and chemical reaction. Theories of turbulent transport are examined. Prereq: CME 530 or consent of instructor.

633 *Diffusional Mass Transfer Operations.* (3)
An advanced course in diffusional processes depending upon the current literature for much of its content. Multicomponent diffusional processes. Turbulent diffusion. The modelling of diffusion in biological systems. Prereq: CME 530 or consent of instructor.

635 *Staged Mass Transfer Operations I.* (3) I
An advanced lecture and problem course dealing with staged mass transfer processes involving vapor-liquid systems. Binary, multi-component, and azeotropic distillation. Design and performance of distillation systems. Prereq: CME 422, CME 520.

636 *Staged Mass Transfer Operations II.* (3) II
Mass transfer between two liquid phases or between solid and liquid phases, including: extraction, leaching and adsorption, molecular and eddy diffusion. Application of finite difference calculus. Design of staged processes including: efficiencies, pulsed columns and controlled cycling. Prereq: CME 422.

638 *Transport Phenomena in Packed and Fluidized Beds.* (3)
A course dealing specifically with the dynamics of heat, mass and momentum transport in packed and fluidized beds. Current experimental findings and transport theories, and bed characterizations are discussed. Analytic and difference methods are used to solve problems. Prereq: CME 530 or consent of instructor.

642 *Advanced Process Control I.* (3) I
Linear and nonlinear automatic control theory, dynamics of chemical process systems, design of systems. Prereq: CME 562.

643 *Advanced Process Control II.* (3) II
A continuation of CME 642. Prereq: CME 642.

650 *Advanced Chemical Reactor Design.* (3)
Rate expressions for heterogeneous reaction kinetics; energy and mass transport within and external to reacting porous catalysts; design equations for fixer, moving, and fluidized-bed reactors. Prereq: CME 530 and CME 550 or consent of instructor.

680 *Biochemical Engineering.* (3)
The advanced technology of batch and continuous fermentation units, including microbial nutrition, energy considerations, heat and mass transfer, biochemical reaction kinetics, and process control. Prereq: CME 530 and CME 550; MB 400 or consent of instructor.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence.

769 *Residence Credit for the Doctor's Degree.* (0)
(1 to 12 credits equivalence.)

771 *Seminar.* (0) I, II
Review of current literature in the field of chemical engineering, general discussion and presentation of papers on departmental research. One lecture per week. Required for all graduate students in chemical engineering.

780 *Special Problems in Chemical Engineering.* (3) I, II, S
Independent study, design, or research in chemical engineering topics. Six laboratory hours per week. May be repeated to a maximum of 12 credits. Prereq: Approval of the Departmental Director of Graduate Studies.

CIVIL ENGINEERING

The Department of Civil Engineering offers the M.S. and Ph.D. with specialization in the following areas:

Environmental, sanitary and water resource engineering
Fluid mechanics, hydraulics and hydrology
Mining and rock mechanics
Planning and management of engineering systems
Soil mechanics, soil dynamics and foundation engineering
Structural engineering and structural systems
Transportation engineering and transportation systems

These programs utilize courses from other departments and such interdepartmental programs are encouraged. Engineering Mechanics, Mechanical Engineering, Chemical Engineering, Agricultural Engineering, Mathematics, Geology, Biology, and Chemistry are some of the departments whose offerings contribute to the programs in Civil Engineering.

The Department of Civil Engineering has a program with local engineering firms under which support for the student is available in return for the students' services. The students gain both practical experience and financial support through this program. The department also offers training grants in the area of pollution control.

A non-thesis option for the M.S. degree is available for students with acceptable previous research or design experience. If a student wishes to pursue this option, he should submit a request to the Director of Graduate Studies.

425 *Soil Mechanics.* (3) I, II
A study of soil and its utilization in foundations for structures and subgrade for highways. Stabilization and improvement of bearing values. Lectures and recitations, two hours; lab, 3 hours per week. Prereq. or concur: GLY 200, EM 322. *Hardin, Huang and Divenick.*

435 *Mine Plant and Machinery.* (3) II
Theory and practice of mine haulage, hoisting, drainage, pumping and compressed air as power. Application of engineering principles to the mineral industries. Lecture and recitation, two hours; lab, three hours. Prereq: CE 231, or consent of instructor. *Wright.*

480 *Structural Mechanics II.* (3) I, II
Continuation of CE 380 with emphasis on sophisticated methods of analyzing complex structures. Prereq: CE 380. *Korn.*

515 *Geometronics.* (3) I
Fundamental principles of geodesy, engineering astronomy and precise survey procedures; triangulation, trilateration and adjustment computations; theory of electronic distance measurement; applications to the horizontal and vertical control of engineering construction and photogrammetric mapping. Lecture, 2 hours; lab, 3 hours. Prereq: MA 214; CE 214. *Dearinger.*

523 *Photogrammetry.* (3)
Fundamentals of the photogrammetric method including: geometry of the single photographs and terrestrial photographs; planning the photographic mission and ground control for mapping and an introduction to analytic photogrammetry, stereophotogrammetric plotting instruments, photo interpretation and remote sensing. Applications to problems in engineering, geography, geology and other disciplines are emphasized. Two class hours per week; lab, three hours per week. Prereq: MA 113 and consent of instructor.

531 *Coal Preparation I.* (3) I
Principles and practice of coal preparation and associated operations. Lecture and recitation, two hours; lab, three hours. Prereq: CE 231, or consent of instructor. *Haley.*

532 *Coal Preparation II.* (3) II
A continuation of CE 531. Lecture and recitation, two hours; lab, three hours. Prereq: CE 531. *Haley.*

533 *Rock Mechanics.* (3) I
An engineering science course leading to an understanding of the stresses in the earth, properties of the materials resisting these stresses and methods of determining these stresses. Stability of excavations. Lecture and recitation, three hours. Prereq: MET 301, EM 322, GLY 200 or consent of instructor. *Wright.*

540 *Pavement Analysis and Design.* (3) II
Pavement types and wheel loads; stresses in flexible and rigid pavements; effect of climate and subgrade soils on pavement performance; evaluation of strength and other properties of soils, base courses, and paving materials; structural design of flexible and rigid pavements; pavement performance. Lecture and recitation, three hours. Prereq: CE 302, 340.

543 *Development of Transportation Facilities.* (3) II
Analysis of factors affecting development of transportation facilities: history of transportation development; problems of highway geometrics, design standards and traffic estimates and assignment; basic planning and location principles; programming improvements, maintenance and new construction; concepts of highway management, finance and public relations. Prereq: Credit or registration in CE 342. *Hutchinson.*

550 *Engineering Hydraulics.* (3) II
Analysis of flow in closed conduits and natural and artificial open channels. Design of hydraulic structures. Lecture, 3 hours. Prereq: ME 330. *Land.*

553 *Hydrology.* (3) I, II
A study of the factors affecting the occurrence, movement and utilization of water including meteorological considerations, evaporation, transpiration, runoff relationships, hydrograph analysis, and ground water management. Lecture, 3 hours. Prereq: ME 330 or consent of instructor. *James and Foree.*

555 *Engineering Economy.* (3) I
Economic evaluation and financial analysis of engineering alternatives in which the goal of economic efficiency is applied to engineering design. Lecture, 3 hours. Prereq: ECO 261 or consent of instructor. *James.*

566 *Public Health Engineering.* (3) II
Application of engineering principles to the control of the environment, as used by sanitary engineers in federal, state or international health agencies. Lecture, three hours. Prereq: consent of instructor. *Staff.*

568 *Sanitary Engineering Laboratory.* (3) I
Lectures and laboratory practice in principles, application and interpretation of analytical tests used in sanitary engineering research and plant control. Lecture, two hours; lab, three hours. Prereq: consent of instructor. *Lauderdale.*

580 *Theory of Structures III.* (3) I
Plastic design of steel. Introduction to theory of arches. Theory and design of continuous trusses. Lecture and recitation, three hours. Prereq: CE 480 and MA 214. *Gesund.*

621 *Engineering Aspects of Surficial Soils and Landforms.* (3) II
Techniques of terrain analysis for civil engineering purposes through the use of air photo interpretation (quantitative and qualitative) and other sources of pedologic, geologic and topographic information. Lecture, 2 hours; lab, 3 hours. Prereq: GLY 200. *Dearinger.*

625 *Advanced Soil Mechanics I.* (3) I, II
Detailed study including experimental determination of the strength and deformation properties of granular and cohesive soils. Colloidal phenomena in soils as related to the behavior of clay soils are included. Lecture, two hours per week; lab, three hours. Prereq: CE 425 or consent of instructor. *Hardin or Deen.*

626 *Advanced Soil Mechanics II.* (3) I
Study of seepage through soils and drainage methods for control of seepage. Study of the stress distribution in earth masses and detailed study of soil identification, classification and distribution for engineering planning and design. Lecture, three hours per week. Prereq: CE 425 or consent of instructor. *Hardin.*

627 *Soil Engineering for Transportation Facilities.* (3) I, II
Study of frost action and moisture movement in soils and of soil compaction and stabilization. Study of engineering analysis and design for the stability of earth slopes and embankments. Lecture, three hours per week. Prereq: CE 425 or consent of instructor. *Hardin.*

628 *Advanced Foundation Engineering.* (3) II
Application of the principles of soil mechanics to the design and analysis of foundations. Lectures, three hours. Prereq: CE 625 or consent of instructor. *Hardin.*

629 *Soil Dynamics.* (3) II
A study of the response of soils to dynamic loads including foundation vibration problems and the response of footings to impulse loads. Theories of wave propagation in granular and porous media and methods of measurement of the dynamic properties of soils in the laboratory are included. *Hardin.*

631 *Advanced Prospecting.* (3) I, II
Study of the principles involved in the geophysical investigation of the minerals of the earth's crust. Lecture and recitation, two hours; lab, three hours. *Wright.*

632 *Preparation and Uses of Industrial Minerals.* (3) I, II
Sources, processing, marketing, utilization and economics of non-metallic minerals, and product specifications. Clay, limestone, asbestos, refractories. Lecture and recitation, three hours. Prereq: B.S. degree in Engineering. *Wright.*

633 *Mine Organization.* (3) I, II
Detailed study of the structure and function of a mining enterprise from both the financial and the engineering standpoint. Lecture and recitation, three hours. *Wright.*

634 *Advanced Mine Engineering.* (3) I, II
Procedures and methods of collecting and recording data for the systematic development and exploitation of a mining property. Lecture and recitation, three hours; drawing and mapping, six hours. May be repeated for a total of six credits. *Wright.*

639 *Air Transport Engineering.* (3)
Planning, location and design of airports, STOL ports and heliports. Air traffic operations, performance, and control as related to facility requirements. Role of governmental agencies. Prereq: CE 342 or consent of instructor.

640 *Highway Administration, Economics and Finance.* (3) I
A study of highway administration, economics and finance; including organization of highway departments, sources and types of revenue, road costs, classification of roads, benefits from improvements, and program planning. Lecture, three hours. Prereq: CE 340. *Staff.*

641 *Highway Traffic Characteristics.* (3) I
Vehicle operating characteristics; driver, pedestrian and roadway characteristics as they individually, and collectively as traffic stream characteristics are related to the planning, design and operation of highway facilities. Lecture, three hours. Prereq: CE 340. *Hutchinson.*

642 *Highway Location Analysis.* (3) I, II
Optimization of highway location through a study of the effects of terrain, traffic, geometrics, standards and specifications, earthwork, structures, pavement, drainage, right of way acquisition, maintenance and road user costs; application of computer oriented methods of volumetric computations and economic analysis. Prereq: CE 340. *Dearinger.*

643 *Urban Transportation Planning.* (3) I
A detailed review of the transportation planning process; inventory methodologies; trip generation, distribution and assignment with associated mathematical models and theories; prediction of future travel; land use models; modal split; developing and testing proposed systems; simulation. Lecture, three hours. Prereq: CE 543 or equivalent and STA 381 or STA 681 or equivalent statistics course. (Same as GEO 643.) *Dearinger.*

644 *Operational Effects of Geometrics in Transportation.* (3) II
Operational effects of the geometry of transportation facilities; includes capacity, safety, and economic considerations prompting current and impending changes in geometric design of intersections, interchanges, horizontal and vertical alignment, clearances, cross section elements and interfaces between elements of the transportation system. Lecture, three hours. Prereq: CE 340; credit or registration in CE 641 or equivalent. *Hutchinson.*

645 *Highway Design, Construction and Maintenance.* (3) II
A study of highway design, construction and maintenance; including physical aspects of design, drainage, road types, structural pavement design, construction methods and supervision and maintenance methods. Lecture, three hours. Prereq: CE 340 or consent of instructor. *Staff.*

646 *Bituminous Paving Materials.* (3) II
Origin, production, use-classifications and significant engineering properties of bituminous materials; design of bituminous concrete pavements and highway wearing surfaces. Includes the most recent developments of practical and potential significance in the highway industry. Covers specifications and materials testing. Lecture, two hours; lab, three hours. Prereq: CE 540 and CE 302 or consent of instructor. *Havens.*

647 *Cements, Concretes and Aggregates.* (3) I
Origin, production, use-classifications and significant engineering properties of Portland cements, concretes and mortars. Covers: precise methods of design and control of mixes; durability considerations; pozzolans; additions and admixtures; mineral aggregates; structural, paving and mass concretes; specifications and materials testing. Lecture, two hours; lab, three hours. Prereq: CE 540 and CE 302 or consent of instructor. *Staff.*

652 *Open Channel Flow.* (3) II
The hydraulics of free surface flow including such topics as uniform flow, varied flow, unsteady flow, the hydraulic jump flow transitions, spillways and channel delivery. Lecture, 3 hours. Prereq: CE 550. *Staff.*

653 *Advanced Hydrology.* (3) II
Advanced discussion of special topics relating to hydrology including sediment transport, flow through culverts and bridges, frequency analysis, waves, infiltration, and computer models. Lecture, 3 hours. Prereq: CE 553. *James.*

654 *Hydraulic Structures.* (3) I
Structural and hydraulic analysis required for the design of concrete and earth dams and appurtenant structures. Prereq: CE 550. *Staff.*

655 *Water-Resources Planning.* (3) II
Presentation of techniques for evaluating water-resource projects to meet social objectives with specific reference to such purposes as flood control, drainage, water supply, hydropower, navigation and recreation. Lecture, 3 hours. Prereq: CE 555. *James.*

659 *Advanced Sanitary Engineering Design I.* (3) I
Application of theory of water treatment processes to the functional and hydraulic design of water treatment facilities. Lecture, two hours; lab, three hours. *Lauderdale.*

660 *Advanced Sanitary Engineering Design II.* (3) II
Application of theory of waste treatment processes to the functional and hydraulic design of waste treatment facilities. Lecture, two hours; lab, three hours. *Lauderdale.*

662 *Fundamentals of Water Quality Control I.* (3)
Theory of water purification and waste water treatment with emphasis upon the physical and chemical process which are particularly applicable to municipal and industrial waste treatment. Prereq: CE 568.

663 *Water Quality Control Laboratory.* (3) II
Laboratory studies of pollution control processes and techniques discussed in CE 662 and 664. One hour lecture, six hours lab per week. Prereq: CE 568 or consent of instructor.

664 *Fundamentals of Water Quality Control II.* (3)
Continuation of CE 662 with emphasis upon biological processes. Prereq: CE 568.

668 *Advanced Instrumentation for Water Resources Research.* (3) II
The theory and application of advanced techniques of analysis to water resources research. *Lauderdale.*

669 *Water Quality in Surface Waters.* (3)
Water quality requirements for various beneficial uses. Analysis of dispersion, advection, evaporation, natural aeration, biological oxidation, and photosynthesis, their effects on the physical, chemical and biological quality of waters in streams, lakes, reservoirs, estuaries, and other surface waters. Eutrophication. Prereq: MA 214 and CE 355, or consent of instructor.

674 *Mechanics of Liquid Flow in Pipes.* (3) II
Steady and unsteady one dimensional pipe flow. Water hammer and surge tank analysis. Steady two dimensional pipe flow. Digital and analog computer applications. Lecture 3 hours. Prereq: CE 550. *Wood.*

678 *Fluid Dynamics of Multiphase Systems.* (3)
A study of the dynamics of multiphase systems, consist of mixtures of solid particles, liquid droplets, or bubbles in fluids. Prereq: ME 330; MA 214.

681 *Dynamics of Structures.* (3) II
Behavior of materials under dynamic stresses, dynamic response of multidegree of freedom–concentrated mass systems, dynamic response of distributed mass structures, design of structures for earthquake, wind, traffic and machinery loads. Prereq: EM 513 or permission of instructor. *Gesund.*

682 *Experimental Structural Analysis.* (3) I
Theory and practice of model analysis to facilitate the solution of unusual problems in structural engineering. Dimensional analysis, similitude requirements, materials, fabrication, loading and instrumentation of models, and interpretation of results. Lecture, 1 hour, lab, 6 hours. *Pincus.*

686 *Advanced Metal Structures.* (3) I
Plastic analysis and design; shear, local and lateral buckling, compression members, welded, riveted and bolted connections, deflections and shakedown. Light gage cold-formed steel design. Strain hardening and stress concentrations; residual stresses, brittle fracture; fatigue. Torsion, thin-walled sections, multicell sections. Lecture, 3 hours. Prereq: CE 480 and EM 531 concurrent. *Korn.*

690 *Suspended Structures.* (3) I, II
Theory and application of stress analysis and design as applied to suspended structures and suspension systems. Lecture, two hours; lab, two hours. Prereq: consent of instructor. *Korn.*

691 *Advanced Reinforced Concrete Theory.* (3) II
Background and origin of modern reinforced concrete design procedures and codes. Comparison of American and foreign methods of analysis. Review of current research and projection to anticipated future changes in design and construction practices. Prereq: EM 531. *Gesund.*

692 *Slab and Folded Plate Structures.* (3) I, II
Design and analysis of reinforced concrete floor slabs and folded plate roofs. Elastic and inelastic methods. Lecture, three hours. Prereq: CE 480, EM 531, or consent of instructor. *Gesund.*

693 *Shell Structures.* (3) I, II
Design and analysis of reinforced concrete shell structures, including domes, barrel shells, hyperbolic paraboloids and cylindrical tanks. Lecture, three hours. Prereq: CE 692 or consent of instructor. *Gesund.*

694 *Advanced Structural Analysis I.* (3) I, II
Theory and application of classical methods for the solution of complex planar structural systems. Prereq: CE 480 or consent of instructor. *Korn.*

695 *Advanced Structural Analysis II.* (3) I, II
Theory and application of matrix methods of analysis to complex plane and space structures. Prereq: CE 694. *Korn.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of 6 credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

771 *Seminar.* (0) I, II
Review of current literature in the field of Civil Engineering, general discussion and presentation of papers on departmental research. Required of all graduate students. Two hours. *Staff.*

780 *Special Design Problems in Civil Engineering.* (1-6)
Individual work on some selected design problems in one of the various fields of Civil Engineering. Laboratory, six hours. Prereq: approval of the Chairman of Department. May be repeated to a maximum of nine credits. *Staff.*

790 *Special Research Problems in Civil Engineering.* (1-6)
Individual work on some selected research problems in one of the various fields of Civil Engineering. Lab, six hours. Prereq: approval of the Chairman of Department. May be repeated to a maximum of nine credits. *Staff.*

ELECTRICAL ENGINEERING

The Department of Electrical Engineering offers programs leading to M.S. and Ph.D. degrees. Areas of current research interests include: energy conversion; modern control theory; automata theory; radio-frequency spectroscopy; microwave absorption studies; solid-state electronics; biomedical engineering; and electromagnetics.

The laboratories are well-equipped for research in the above areas under the direction of the electrical engineering faculty. For further information on financial aid and other details, write to the Department Chairman.

401 *Electronic Analog Computation.* (3) I
Analog computer components and their interconnection. Time and amplitude scaling. Simulation of linear and non-linear physical systems from all fields of engineering. Two class hours per week; three lab hours per week. Prereq: MA 214 or consent of instructor.

415 *Electromechanics.* (3) I, II
A study of construction, operating characteristics (by mathematical analysis), and applications of electrical machines. Prereq: EE 221. Concur: EE 416; 467. *Nasar.*

416 *Electrical Engineering Laboratory III.* (2) I, II
Laboratory practice and experimental studies related to EE 415. Lecture, one hour; lab, three hours. Prereq. or concur: EE 415. *Petway.*

420 *Engineering Analysis I.* (3) I, II
A study of engineering analysis stressing fundamental mathematical and physical principles; electrical-mechanical analogs; time domain and frequency domain analysis; Fourier series and integral, series solutions of Bessel's and Legendre's equations. Lecture and recitation, three hours. Prereq: MA 214. *Allison.*

435 *Circuits III.* (3) I, II
Fundamentals of network theory in communications circuits; Laplace transforms and wave filters. Three class hours. Prereq: EE 221. *Romanowitz, Collins.*

461 *Electronics and Communications I.* (3)
Transistor and vacuum-tube characteristics. Graphical and mathematical analysis of audio amplifiers, rectifiers and smoothing filters as power supplies. Prereq: EE 221. Concur: EE 462. *Distler.*

462 *Electrical Engineering Laboratory II.* (2) I, II
Experimental exercises in transistor and vacuum-tube characteristics; basic A-F circuits, as voltage and power amplifiers, oscillators, and rectifiers. Lecture, one class hour; lab, 3 hours. Prereq: EE 222. Concur: EE 461. *Distler.*

467 *Electric and Magnetic Fields.* (3) I, II
Field laws and theorems in vector form; fields in dielectric and magnetic media; forces, moments, energy, power; brief introduction to time-varying fields. Prereq: PHY 232, MA 213. Three class hours. *Romanowitz.*

468 *Fields and Waves.* (3) I, II
Maxwell's equations; vector and scalar wave equations; bounded solutions (transmission lines; waveguides); unbounded solutions (antennas); Poynting's theorem; fields in moving media. Three class hours. Prereq: EE 420, 467.

507 *Electrical Controls I.* (3) I, II
Block diagram and transfer function representation of linear control systems. Basic servo characteristics. Stability and frequency response. Analysis and synthesis by Nyquest diagram, bode diagram and root-locus method. Three class hours. Prereq: EE 435. *Yeh.*

508 *Electrical Engineering Laboratory IV.* (2) I, II
Laboratory study of control methods and systems employing magnetic and electronic components; analog computers. Lecture, one hour; lab, three hours. Prereq: or Concur: EE 507. *Jackson.*

511 *Information Theory.* (3) I
Time and frequency domains; sampling theorems; review of AM-FM; pulse modulation; probability and random signal theory; autocorrelation; noise. Prereq: EE 420. *Distler.*

517 *Electrical Machinery II.* (3) I, II
Electro-mechanical energy conversion systems studies. Development of generalized equivalent circuits for various conditions of operation. Prereq: EE 415, 416.

520 *Engineering Analysis II.* (3) I, II
Investigation of transient and steady-state conditions in electrical and mechanical systems, using Laplace transforms, vectors, complex variables: network analysis and synthesis. Feedback system stability criteria. Lecture and recitation, 3 hours. Prereq: EE 420. *Distler, Allison.*

523 *Electrical Equipment Problems.* (2) I, II
A creative design study of comprehensive engineering problems, primarily electrical but related to engineering in general. One class hour, five hours by appointment. Prereq: Senior classification.

537 *Electric Power Systems I.* (3) I
Transmission line parameters, generalized circuit constants; analysis of line performance. Prereq: EE 415, 416. *Staff.*

538 *Electric Power Systems II.* (3) II
Per-unit studies; symmetrical components, experimental studies on a-c network analyzer. Prereq: EE 537. *Staff.*

562 *Electronics and Communications II.* (3) I, II
Feedback amplifiers, tuned and untuned amplifiers; oscillators, AM and FM transmitters. Three class hours. Prereq: EE 461. *Adams.*

564 *Electronics and Communications III.* (3) I, II
Timing, scanning, trigger logic and pulse circuits:; video and broad-band R-F amplifiers. Three class hours. Prereq: EE 461. *Allison, Bradley.*

565 *Electrical Engineering Laboratory V.* (2) I, II
Laboratory practice and experimental exercises relating to studies in EE 564. Lecture, one hour; lab, three hours. Concur: EE 564. *Graham, Bradley.*

566 *Magnetic Amplifiers.* (3) II
Wave-form analysis of circuits with nonlinear magnetic elements; saturable reactors and self-saturating magnetic amplifiers in steady-state and transient operation; some characteristics of semiconductor diodes including Zener types; effects of negative and positive feedback on magnetic amplifiers. Three class hours. Prereq: EE 415. *Distler.*

569 *Microwave and Coherent Optics Measurement.* (3)
Theory and practice of measurement of coherent microwave and optical radiation from waveguides, lasers, and antennas, including analysis of errors. Laboratory measurement of frequency, power, impedance, polarization and patterns of coherent waves. Two class hrs. per wk; lab, 3 hrs. Prereq: EE 468.

572 *Electrical Controls II.* (3) II
Analysis and design of non-linear feedback control systems. Phase plane, describing function, and piecewise linear techniques are developed. Stability of non-linear feedback systems is studied. Three class hours. Prereq: EE 507. *Petway.*

580 *Logical Design of Analog and Digital Systems.* (3)
Computation elements; analysis and synthesis of systems, Boolean functions and applications to relay and electronic circuits; circuit logic, memory elements; prime implicate synthesis of iterative networks; sequential circuits, digital devices. Lecture and recitation, three hours. Prereq: EE 221. *Staff.*

581 *Advanced Logical Design.* (3) II
Boolean matrices; Boolean trees; design of sequential circuits. Design of digital and hybrid computers. Prereq: EE 580. *Cosgriff.*

585 *Molecular Engineering.* (3) II
Molecular approach to the behavior of gaseous conductors, semi-conductors, dielectrics and magnetic materials; emphasis on modern semi-conductor electronic devices such as masers, lasers, Esaki diodes, Zener diodes, and micromodules. Lecture, 2 hours; laboratory, 3 hours. Prereq: EE 420, 467. *Kadaba, Bradley.*

595 *Independent Problems.* (1-3)
For electrical engineers. A problem, approved by the chairman of the department, provides an objective for study and reesarch. May be repeated to a maximum of six credits. Prereq: 2.5 standing.

601 *Electromagnetic Energy Conversion I.* (3)
General dynamical theories are developed for electromechanical energy systems. Various constraints are applied to the generalized equations of motion and energy transfer. Prereq: Consent of instructor.

602 *Electromagnetic Energy Conversion II.* (3)
Continuation of EE 601, with special attention to specific areas of machine types. Prereq: EE 601.

606 *Electric Power Transmission.* (3)
The theory underlying the calculation and operation of long distance transmission circuits. Special attention to relay control. Recitation, 3 hours. Prereq: EE 538.

611 *Linear Circuit Analysis I.* (3)
Laplace and Fourier transform methods of analysis of linear lumped constant systems under transient and steady state conditions; feedback amplifiers; filter networks; stability and physical realizability. Prereq: EE 520. *Distler, Graham.*

612 *Linear Circuit Analysis II.* (3)
Continuation of EE 611 with an introduction to non-linear systems. Prereq: EE 611. *Distler, Graham.*

613 *Optimal Control Theory.* (3)
State-space modeling of control systems; variational techniques; system optimization by maximum principle, dynamic programming; Hamilton-Jacobi equations, design of linear optimal systems; computational methods for solving boundary value problems. Prereq: EE 611.

614 *Sampled-Data Control Systems.* (3) I, S
Z-transforms, Nyquist criterion, Bode and root locus plots, error constants, finite settling-time design, sensitivity, state variables. Three class hours per week. Prereq: EE 520, or consent of instructor. *Distler, Petway.*

615 *Stability Theory of Control Systems.* (3)
Stability theorems are studied with emphasis on application to closed-loop control systems. Three class hours per week. Prereq: EE 572.

616 *Advanced Topics in Control.* (3)
Current research and design practices in control devices and systems. May be repeated twice. Three class hours per week. Prereq: EE 613, EE 614 or consent of instructor.

621 *Introduction to Antennas.* (3)
Fundamental Antenna concepts, Array Theory, Linear Radiators, Loops, Helices, Mutual Coupling, Reflectors, Measurement Theory. Three class hours per week. Prereq: EE 567.

622 *Advanced Antennas.* (3)
Traveling wave concepts, line sources, Huygen's Principle, Babinet's Principle, synthesis techniques, traveling wave antenna design, practical traveling wave antennas, non-uniform arrays, supergain, Brillouin Diagrams. Three class hours per week. Prereq: EE 621.

623 *Lines and Wave Guides.* (3)
Open-wire and coaxial lines, standing waves, stub matching; impedance transformation, rectangular and circular wave guides. Prereq: EE 435, 467, 564. *Allison, Kadaba.*

624 *Solid State Electronics.* (3) I
Bose and Fermi statistics; semiconductor theory; solid-state devices; electrical properties of insulators; theory and applications of magnetic materials, including ferrites. *Kadaba, Bradley.*

625 *Electromagnetic Propagation and Scattering.* (3)
Propagation in various media: Plasmas, Magnetoplasmas, and Compressible Plasmas. Diffraction by spheres. Boundary Value Problems. Turbulence. Three class hours per week. Prereq: EE 468, EE 520.

626 *Microwave Engineering.* (3)
Generation, detection and measurement of microwave energy; vacuum tubes at ultra high frequencies, the klystron, the magnetron, travelling wave tubes and ferrite devices. Lecture, two hours; lab, three hours. Prereq. or concur: EE 468. *Allison, Kadaba.*

627 *Electromagnetic Fields.* (3)
Advanced studies in electromagnetic fields; antennas, radiation and propagation of energy. Prereq: Consent of instructor. *Adams, Carver.*

631 *Discrete Information Theory I.* (3) I
Entropy, Markov sources, algebra of codes, classification of codes, Shannon's theorems, compact codes, linear codes, error detection and correction, syndrome vectors. Prereq: Consent of instructor. Three class hours per week. *Distler.*

632 *Discrete Information Theory II.* (3) II
Plotkin, Gilbert, and other bounds; Hamming codes, Reed-Muller and other linear codes; cyclic codes, Bose-Chandhuri codes, sequential decoding, convolution encoding. Prereq: EE 631. *Distler.*

633 *Advanced Information Theory.* (3)
Shannon type information theory regarding channel capacity, entropy, band-limited systems for both memory and memoryless channels. Three class hours per week. Prereq: EE 511, STA 523 or consent of instructor.

635 *Pattern Recognition.* (3)
Introduction to and equivalence of approaches to pattern recognition, matched filtering, decision theoretic methods, sequential approach and learning machines. Three class hours per week. Prereq: EE 640.

640 *Continuous Stochastic Processes I.* (3) I
Random variables, stochastcic processes, stationary processes, correlation and power spectrum, mean-square estimation, filter design, decision theory, Markoff processes, simulation. Three hours lecture per week. Prereq: STA 523.

641 *Continuous Stochastic Processes II.* (3) II
Continuation of EE 640. Three class hours per week. Prereq: EE 640.

650 *Electro-Optical Properties of Materials.* (3)
The effects of electric fields upon light propagation in media. Lasers, electro-optic modulation, non-linear optics, laser noise, optical parametric oscillator, stimulated Raman emission, coherent scattering. Three class hours per week. Prereq: EE 670.

653 *Optical Processing.* (3)
Emphasis on both the mathematical modeling and the use of optical equipment in the solution of diverse physical problems which lend themselves to a "photographic" type output. Two class hours; three lab hours per week. Prereq: PHY 508.

660 *Electronic Device Design.* (3)
An integrated treatment of the theory and application of electronic devices, with emphasis on methods of engineering analysis and design. Three class hours per week. Prereq: EE 585 or consent of instructor.

664 *Semiconductor Theory.* (3)
The electric, magnetic, optical and thermal properties of semiconductors. Three class hours per week. Prereq: PHY 598, PHY 599, MA 214.

670 *Quantum Electronics.* (3)
The interaction of electromagnetic radiation fields and atomic systems and devices that make use of such interactions. Three class hours per week. Prereq: EE 624.

683 *Automata Theory.* (3)
Decomposition of Sequential Machines, State Assignment, Finite Memory Machine, Shifting Operators as applied to Structural Machines, Turing Machines, Pattern Classification by State Machines. Three class hours per week. Prereq: EE 580, MA 561.

711 *Network Synthesis I.* (3) I
The first of a two-semester sequence of courses giving a comprehensive treatment of modern network synthesis. Prereq: EE 611. *Graham.*

712 *Network Synthesis II.* (3) II
The second of a two-semester sequence of courses giving a comprehensive treatment of modern network synthesis. Prereq: EE 711. *Graham.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

769 *Residence Credit for Doctor's Degree.* (0)
May be repeated indefinitely. (1 to 12 credits equivalence.)

771 *Seminar.* (0)
Review of current literature in the field of Electrical Engineering, general discussion and presentation of papers on departmental research. Required of all graduate students. Two class hours. *Allison.*

783 *Special Problems in Electrical Engineering.* (1-3)
Open to graduate students only. Individual work on an assignment approved by the chairman of the department. May be repeated to a maximum of nine credits.

ENGINEERING MECHANICS

The Department of Engineering Mechanics offers graduate programs which emphasize the analysis of deformable bodies, especially solids, and dynamics. In the courses the fundamental framework of a particular phenomena or class of responses is examined as well as the more common applications. Students in engineering mechanics come from all the fields of engineering as well as physics and mathematics. They usually begin their program by taking common core courses and mathematics. Subsequently they proceed to specialize according to their own professional objectives in programs which are tailored on an individual basis.

503 *Introduction to Continuum Mechanics.* (3) I
An introduction to the mathematical description and continuum concepts of deformable materials. Review of linear algebra and Cartesian tensor analysis. Finite deformation and rate of deformation. Balance principles. Principle of material indifference. Study of constitutive equations of linear elasticity, Newtonian fluids, linear viscoelasticity, hyperelastic materials and special non-Newtonian fluids. Sample problems. Prereq: MA 433 or consent of instructor. *Vogel, Beatty, Leigh.*

513 *Mechanical Vibrations.* (3) I, II
Vibrations of systems of one and several degrees of freedom, critical speeds and torsional and lateral vibrations of shafts. Lecture and recitation, three hours. Prereq: EM 313. *Dillon, Vogel, Shippy.*

531 *Advanced Strength of Materials.* (3) I, II, S
Unsymmetrical bending of beams, thin plates, stress analysis of thick-walled cylinders, and rotating discs. Theory of elastic energy, curved beams, stress concentration, and fatigue. Lecture and recitation, three hours. Prereq: EM 322. *Adams, Rizzo.*

532 *Experimental Stress Analysis.* (3) II
Experimental stress analysis from an engineering viewpoint. Preliminary optics; stress-optic law; isoclinic and stress trajectories; strain gauges; rosettes; miscellaneous experimental techniques. Prereq: EM 531. *Adams.*

533 *Aircraft and Missile Structural Analysis.* (3) I, II
Analysis of semi-monocoque structures in bending and torsion. Energy and approximate methods; shear lag; and thermal effects. Introduction to creep and plasticity. Three class hours per week. Prereq: EM 313. *Dillon, Vogel.*

585 *Fourier Series and Boundary Value Problems.* (3)
An introductory treatment of Fourier series and its application to the solution of boundary value problems in the partial differential equations of physics and engineering. Orthogonal sets of functions, Fourier series and integrals, solution of boundary value problems, theory and application of Bessel functions and Legendre polynomials. (Same as MA 485.) Prereq: MA 432 or equivalent.

603 *Theoretical Plasticity I.* (3) I
An introductory mathematical treatment of the perfectly plastic solid. Real and idealized materials; yield criteria; flow rules; experimental basis of the theory; contained plastic flow; some two-dimensional problems. Prereq: MA 433 or consent of instructor. *Dillon.*

604 *Theoretical Plasticity II.* (3) II
Continuation of EM 603. Limit analysis; plastic bending and torsion; structures and shells; thermoelasticity; plastic wave propagation. Prereq: EM 603. *Dillon.*

605 *Foundations of Inelasticity.* (3) I
A critical and constructive discussion of the assumptions and experimental evidence for inelastic material response from a viewpoint of the mechanist. Lecture and recitation, three hours. Prereq: EM 604, 662. *Dillon.*

606 *Theoretical Elasticity.* (3) II
A mathematical account of the linear elastic solid as special continuum. Solution of boundary value problems; two-dimensional examples; torsion and bending; stress concentrations; strain energy; thermoelasticity. Some direct methods of solution for difficult problems, and introduction to dynamic elasticity. Lecture and recitation, three hours. Prereq: EM 503 or consent of instructor. *Dillon, Rizzo, Yau.*

607 *Advanced Inelasticity.* (3) II
A continuation of EM 605 with a study of the latest research results in the area of inelasticity. Lecture and recitation, three hours. Prereq: EM 605. *Dillon.*

613 *Nonlinear Oscillations.* (3) I
Analysis of various nonlinear oscillatory mechanical systems. Solutions of the differential equations of motion; response curves for forced oscillations; determination of stability criteria. Three class hours per week. Prereq: EM/ME 646 or permission of the instructor. *Shippy.*

614 *Mechanics of Space Vehicles.* (3) II
Description of rigid body orientation, angular velocity, and angular acceleration in terms of Euler angles, Euler parameters, and direction cosines. Gravitational forces and torques and their effect on the attitude motions of symmetrical and unsymmetrical near-earth satellites. Effects of gyroscopic devices, energy dissipation, and elastic flexibility on the stability of space vehicles. Three class hours per week. Prereq: EM 613 or consent of instructor. *Robe.*

632 *Theory of Elastic Stability.* (3) II
Buckling of centrally compressed bars. Detailed consideration of elastic and plastic buckling of prismatic bars under simultaneous action of axial and lateral loads. Buckling of frames, lateral buckling of beams, shear effect, energy methods. Lecture and recitation, three hours. Prereq: EM 531. *Adams, Beatty.*

644 *Advanced Dynamics I.* (3) I
Generalized rigid body kinemetics, concept of reference frames, generalized forces for holonomic and non-holonomic systems, inertia properties of rigid bodies, and energy functions. Lagrange's form of D'Alembert's principle for holonomic and non-holonomic systems. Prereq: EM 313, MA 432, or consent of instructor. (Same as ME 644.) *Robe, Shippy.*

646 *Advanced Dynamics II.* (3) II
Continuation of EM/ME 644. Application of Lagrange's equations in deriving equations of motion; first integrals and conservation theorems; Hamiltonian formalism. Applications to engineering systems. Prereq: EM/ME 644. (Same as ME 646). *Robe, Shippy.*

651 *Numerical Methods in Potential Theory.* (3) I
A modern numerical treatment of some classical problems in potential theory. Prereq: MA 433.

652 *Numerical Methods in Elasticity.* (3) II
A continuation of EM 651. Modern numerical treatments of some difficult problems in classical elasticity. Prereq: EM 651. *Rizzo.*

653 *Methods of Applied Differential Equations.* (3)
Integrals of nonlinear partial differential equations; similarity variables and other transformations; perturbation methods; weighted residual methods; numerical methods; selected topics. Prereq: MA 432 or consent of instructor.

661 *Nonlinear Continuum Mechanics I.* (3) I

An introduction to the continuum physics and mathematical theory of the nonlinear mechanical behavior of materials. Review mathematical background. Principles of continuum mechanics. Principles of constitutive equations. Lecture and recitation, 3 hours. Prereq: EM 503 or MA 462 or consent of instructor. *Leigh, Beatty.*

662 *Nonlinear Continuum Mechanics II.* (3) II

Continuation of 661. Classes of materials. Finite elasticity and hyperelasticity. Nonlinear fluids with memory. Approximation theory for memory functionals. Approximations to memory materials. Thermodynamics of memory materials. Lecture and recitation, three hours. Prereq: EM 661. *Leigh, Beatty.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

780 *Special Problems in Engineering Mechanics.* (3) I, II

A forum for the presentation and discussion of a wide range of timely topics of interest to engineering mechanics. Three class hours per week. May be repeated to a maximum of nine credits. Prereq: Approval of Director of Graduate Study.

MECHANICAL ENGINEERING

The Department of Mechanical Engineering provides programs for study and research leading to the Master of Science in Mechanical Engineering, the Master of Science in Nuclear Engineering, and the Doctor of Philosophy. In the master's plan without thesis, the department requires 30 hours of course work plus two formal reports, usually survey papers. The language requirement for the Ph.D. may be satisfied with either German or Russian.

Areas of concentration for research and study are (1) thermal sciences comprising heat transfer, thermodynamics and fluid mechanics, (2) design, (3) biomedical engineering, (4) nuclear engineering, (5) air pollution and (6) systems and controls.

Preparation for graduate study in the department normally consists of a bachelor's degree in engineering. It is not necessary that this degree be in mechanical engineering. An undergraduate degree in chemistry, physics or mathematics combined with a strong interest in engineering topics is excellent preparation for graduate study in mechanical engineering.

The master's degree can be completed in one academic year plus a summer, but students holding assistantships usually find it necessary to spend about two years to complete all of the requirements. The Ph.D. degree has no formal course requirement. Generally students take a number of courses to prepare for the qualifying examinations and usually need to spend two years to complete a suitable dissertation. Most students find one year of course work beyond the master's degree necessary preparation for the qualifying examination.

Laboratories for research are located in Anderson Hall and the Wenner-Gren

Aeronautical Research Laboratories. The latter is wholly devoted to research in biomedical engineering. The departmental laboratories are well equipped with instrumentation and facilities for study in the areas of fluid mechanics, heat transfer, nuclear engineering and air pollution.

475 *Introduction to Nuclear Engineering.* (3)
Introduction to basic topics of nuclear science. Interaction of radiation with matter. Design and operation of nuclear reactors, shielding, instrumentation, health physics, fuel cycles, use of radioisotopes. Three lecture hours per week. Prereq: PHY 232, MA 214.

480 *Thermal Environmental Engineering.* (3)
An introductory course emphasizing the engineering systems aspects of thermal environmental design. A case study approach treats measurement problems, modeling, and equipment specification for design of environmental systems. Examples drawn from terrestial, space and marine environments. Lecture three hours per week. Prereq: Consent of instructor.

514 *Nuclear Reactor Analysis I.* (3)
Neutron cross-sections, the fission process. Infinite medium criticality calculations, the four factor formula. Neutron diffusion and slowing down theory. Age theory, criticality calculations for the homogeneous reactor, elementary reactor kinetics. Reflected reactors multigroup methods. Control rod theory. Hetergeneous reactors. Prereq: or concur: PHY 554, MA 432.

517 *Instrumentation for Research.* (3)
An exploration of modern instrumentation techniques and problems; transducer principles; analysis of dynamic response of instrumentation systems; theory of measurements; random processes; pressure, temperature, strain gauges and inertial measurement techniques; magnetic, optical, electrostatic and other recording systems; automatic data reduction; measurement of errors. Prereq: consent of instructor. *Carter, Sharp.*

530 *Gas Dynamics.* (3)
Consideration of the mass, energy and force balances applied to compressible fluids. Isentropic flow, diabatic flow, flow with friction, wave phenomena, and generalized one-dimensional gas dynamics. Lecture and recitation, three hours. Prereq: ME 321. *Marshall.*

532 *Fluid Transients and Power Control.* (3)
A course in the analysis of fluid transients and the theory and design of fluid power controls and their application in engineering systems. Prereq: ME 330. *Bonnell, Funk.*

564 *Propulsion System Design.* (3)
Design of systems for aircraft or missile propulsion. Centrifugal compressors, axial-flow compressors, turbine and exhaust systems, and combustion chambers. Prereq: ME 530. *Marshall.*

567 *Air Pollution Engineering and Economics.* (3) I
The Mechanical Engineering aspects of Air Pollution resulting from Combustion processes. Two class hours per week; lab, three hours per week. Prereq: MA 214, ME 321, or equivalent, ME 330 or equivalent.

583 *Biotechnology.* (3)
The human body as a mechanical system responding to sustained and transient forces and pressures, such as occur in flight, space flight and industrial environments. The physical and behavioral reaction of organisms to dynamic, thermal, radiative and gravitational stresses. Mechanical, hydraulic and pneumatic performance of body subsystems. Use of the human parameters in the design of protective and prosthetic devices and life support systems. Prereq: Consent of instructor. *Lafferty, Lange.*

590 *Elements of Aero-Space Technology.* (4)
Flight performance of airborne and ballistic vehicles. Space vehicle propulsion and structures. The space environment. Man in space. Prereq: ME 321 and 330. *Lange.*

592 *Aerospace Component Design.* (3)
Preparation of a formal proposal on a given requirement in the aerospace field. Execution of the design. Testing of a prototype under proper environmental conditions. Prereq: ME 590. *Lange.*

611 *Nuclear Reactor Analysis II.* (3) II
Advanced topics in reactor analysis. The Boltzmann equation, spherical harmonic methods and other approximate solutions of the Boltzmann equation. Perturbation theory, neutron importance. Introduction to neutron thermalization. Special topics. Three class hours per week. Prereq: ME 514, PHY 555 or concurrent.

615 *Plasma Dynamics.* (3)
Discussion of the properties of ionized gases in magnetic and electric fields. Topics covered include motion of charged particles, statistical behavior of plasmas, conduction and diffusion in ionized gases, ionization phenomena, electromagnetic waves and radiation in plasmas, and derivation of the fundamental magnetogasdynamic equations; continuity, momentum and energy. Lecture, three hours. Prereq: ME 620. *Cremers.*

620 *Advanced Engineering Thermodynamics I.* (3) I
Critical treatment of the laws of thermodynamics, relations among thermodynamic properties; stability of systems; thermodynamic processes; selected special topics. Lecture, three hours. Prereq: ME 321. *Birkebak, Lienhard.*

621 *Advanced Engineering Thermodynamics II.* (3) II
Broad coverage of statistical mechanics, kinetic theory and theory of fluctuations. Relations between quantum and classical statistics; Boltzmann integro-differential equation and its consequences. Applications to reaction equilibrium, property evaluation, and other topics. Prereq: ME 620. *Lienhard.*

622 *Dynamics and Thermodynamics of the Atmosphere.* (3) II
The thermodynamics of air and the dynamics of gaseous, liquid and solid diffusion and subsequent movement in the atmosphere. Three class hours per week. Prereq: MA 214, ME 321 or equivalent, ME 330 or equivalent. *Lange.*

625 *Advanced Heat Conduction.* (3)
Comprehensive study of heat conduction; derivation of governing equations; discussion of the various boundary conditions; review of classical heat conduction solutions; discussion of current problems, methods of solution and engineering applications of heat conduction. Prereq: MA 432. *Cremers, Eichhorn.*

626 *Advanced Heat Convection.* (3)
Comprehensive study of heat convection; derivation of equations of convection of mass, momentum, and energy; boundary layer equations; classical solutions of laminar convection problems; turbulent convection; analogies between momentum and energy. Prereq: ME 625. *Eichhorn.*

627 *Radiation Heat Transfer.* (3)
Principles of thermal radiation, the determination of radiation properties, and the analysis of radiation heat transfer. Results of recent radiation researches are included in the discussions. Prereq: ME 325 or equivalent. *Birkebak.*

628 *Convective Mass Transfer.* (3)
A unified treatment of convective mass transfer; theory of mass transfer; Reynolds flow; calculation procedures; application to systems; simultaneous heat and mass transfer. Prereq: ME 325, 530. *Lienhard.*

630 *Fluid Dynamics I.* (3)
Stress at a point (introduced as a tensor of rank two). Equation of conservation of mass, rate of strain tensor, derivation of Navier-Stokes equation, source-sink flows, motion due to a doublet, vortex flow, two and three dimensional irrotational flow due to a moving cylinder with circulation, two-dimensional airfoils. Prereq: ME 330, MA 432.

631 *Fluid Dynamics II.* (3)
A continuation of ME 630 with emphasis on viscous flow. Exact and approximate solutions, boundary layer theory. Jets, wakes, rotating systems, compressible boundary layer and hydrodynamic stability. Prereq: ME 630 or consent of instructor.

632 *Compressible Fluid Flow.* (3)
Review and extension of one dimensional gas dynamics. Subsonic flow, Hodograph method. Supersonic flow, perturbation method, method of characteristics, oblique shocks. Unsteady wave motion and shock waves. Compressible boundary layers and interaction wave motion and shock waves. Prereq: ME 330, MA 432. *Lienhard.*

633 *Rarefied Gas Dynamics.* (3)
Dynamics of Rarefied Gases: Solution of Boltzmann and Krook equations moment methods. integral iteration, boundary layer in hypersonic flow of a slightly rarefied gas, shock wave structure, Fokker-Planck and Vlasov equations. Lecture, three hours. Prereq: ME 621 and ME 630 concurrent. (Offered every other year.)

634 *Turbulent Flows.* (3)
Physical and analytical description of turbulent flows, isotropic turbulence, boundary layers and shear flows, free turbulence in jets and wakes. Measurement techniques. Lecture, three hours. Prereq: ME 631 or consent of instructor. (Offered every other year.)

642 *Advanced Kinematics of Machinery I.* (3)
Fundamentals in the analysis and synthesis of mechanisms including coupler curves, guided plane systems and linkage design. Lecture, three hours. Prereq: Approval of director of graduate study. *Tao.*

643 *Advanced Kinematics of Machinery II.* (3)
A continuation of ME 642 dealing with the motion of rigid planes passing through multiple positions. Theory and application. Lecture and recitation, three hours per week. Prereq: ME 642. *Tao.*

644 *Advanced Dynamics I.* (3)
Generalized rigid body kinematics, concept of reference frames, generalized forces for holonomic and non-holonomic systems, inertia properties of rigid bodies, and energy functions. Lagrange's form of D'Alembert's principle for holonomic and non-holonomic systems. (Same as EM 644.) Prereq: EM 313, MA 432 and consent of instructor.

645 *System Concepts and Analysis.* (3)
Conceptual development and study of complex systems; their synthesis and design; analysis and optimization of system parameters. Input-output relationships; formulation of mathematical models, parameters and constraints on physical systems. Prereq: consent of instructor. *Funk, Bonnell.*

646 *Advanced Dynamics II.* (3)
Continuation of EM/ME 644. Application of Lagrange's equations in deriving equations of motion; first integrals and conservation theorems; Hamiltonian formalism. Applications to engineering systems. (Same as EM 646). Prereq: EM/ME 644.

647 *System Optimization.* (3)
A course in the theory and application of optimization techniques with emphasis on large engineering systems. Prereq: MA 433 or CS 220. *Bonnell, Carter.*

648 *Automatic Guidance and Control.* (3)
Theory of the automatic control of machines and vehicles. Mathematical models of sensors, computers and actuators. Transfer functions of various vehicles and machines. Effects of non-linearities and noise. Problems of reliability; pneumatic, hydraulic, and electrical systems. Prereq: consent of instructor.

649 *Dynamic Analysis of Mechanical Systems and Components.* (3) I
The analysis of actual dynamic devices with emphasis on the selection of valid and meaningful engineering techniques and prediction of performance for reliable operation of these mechanical systems. Three class hours per week. Prereq: MA 432. *Wilson, Carter.*

650 *Fluidic Systems.* (3)
Introduction to combinational, threshold and sequential logic design; digital fluidic devices and sensors, proportional fluid amplifiers. fluidic digital control system design. Three class hours per week. Prereq: ME 532 or consent of instructor.

651 *System Optimization II.* (3)
Introduction to optimal control and its applications, calculus of variations, dynamic programming, maximum principle, differential game theory, adaptive control systems, learning systems. Lecture and recitation, three hours. Prereq: ME 647.

662 *Propulsion Systems.* (3)
Theory of propulsion by jet; efficiencies, specific consumptions; specific impulse. Primary jet devices; turbojet, ducted fan, ramjet, rocket, ram rocket, nuclear power plants. Secondary jet devices for space propulsion; solar propulsion, arc heating devices, ion drive, electromagnetic drive. Prereq: ME 530. *Marshall.*

663 *Energy Conversion Processes.* (3)
Basic considerations of direct conversion of thermal to electrical energy. Thermodynamic and performance characteristics of solid state conversion devices including thermoelectric, thermionic, and photovoltaic systems. Thermodynamic principles and operating characteristics of fuel cells. Analysis of MHD generators and accelerators. Space application of direct energy conversion devices and sources of power. Prereq: ME 325. *Cremers.*

664 *Experimental Methods in Nuclear Engineering.* (3)
A lecture and laboratory course covering the utilization of radiation in engineering, measurement and analysis of parameters pertinent to reactor design and operation, and radiation shielding; reactor response and control studies using analog computer. Prereq. or concurrent: ME 514. *Hahn, Lafferty.*

665 *Nuclear Reactor Dynamics.* (3)
Analysis of dynamic behavior of nuclear reactor systems; transfer function methods applied to nuclear reactor operation and control, stability and analysis from Nyquist and Bode plots, effects of feedback and compensation; instrumentation for reactor start-up and operate conditions. Prereq: ME 343, ME 514. *Hahn, Lafferty.*

666 *Radiation Damage and Shielding.* (3)
A study of the effects of radiation on reactor materials and instrumentation. Macroscopic study of radiation absorption applied to radiation shielding and heat generation in reactors. Prereq: PHY 554. *Staff.*

667 *Nuclear Reactor Design.* (4)
The development of a reactor design from a set of specifications. The synthesis of reactor theory, heat transfer, properties of materials and economics. Prereq: ME 514.

685 *Biofluid Mechanics.* (3)
Rheology of biological fluids with special emphasis on blood; hemodynamics and related blood trauma; biological flow instrumentation; fundamental investigation of circulatory processes; and engineering implication of biological flow processes. Lecture, two hours; lab, three hours. Prereq: ME 330.

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

771 *Seminar.* (0)
Review of current literature in the field of Mechanical Engineering, general discussion and presentation of papers on departmental research. Required of all graduate students. *Staff.*

772 *Bio-Mechanics Seminar.* (1) II

A weekly meeting of the staff and graduate students in Engineering, Physiology Science, Biophysics, Psychology, etc. for the discussion of research and recent developments in Biomedical Engineering such as Biodynamics. May be repeated two times. Prereq: consent of instructor. *Lafferty, Knapp.*

780 *Special Problems in Mechanical Engineering.* (3)

This course consists of individual work in one of the various fields of Mechanical Engineering. Laboratory, six hours. Prereq: approval of the instructor. May be repeated to a maximum of twelve credits. *Staff.*

781 *Special Problems in Bioengineering.* (3)

Discussion of advanced and current topics in Bioengineering. Individual work on research problems of current interest. May be repeated to a maximum of 9 credits. Lecture, three hours.

782 *Advanced Topics in Heat Transfer.* (3)

Contemporary topics in heat transfer will be discussed using the current literature. May be repeated to a maximum of 9 credits. Prereq: Consent of instructor.

783 *Topics in Advanced Systems Theory.* (3)

A survey and evaluation of current research results in systems theory. A course designed to permit full ultilization of specialized abilities of individual and visiting faculty. May be repeated to a maximum of 9 credits. Lecture, three hours. Prereq: Consent of instructor.

METALLURGICAL ENGINEERING AND MATERIALS SCIENCE

443 *Minerals Beneficiation.* (3) II

Principles and mechanics of beneficiation involved in the preparation of mine products, principles of plant design, and current developments. Lecture and recitation, three hours. Prereq: PHY 232. *Swift.*

444 *Minerals Beneficiation Laboratory.* (1) II

Application of the principles studied in MET 443. Laboratory, three hours. Prereq. or concur: MET 443. *Swift.*

451 *Metallurgical Thermodynamics II.* (3) I

Application of fugacity, activity and equilibrium constants to metallurgical systems. Analysis of ideal, non-ideal and regular solutions and their relation to non-metallic solutions at elevated temperatures, molten salt solutions and slags. Discussion and application of the phase rule to metal systems. Lecture, three hours. Prereq: CME 220. *Skaggs.*

453 *Metallurgical Kinetics.* (3) II

Rate processes in heat and mass transfer, nucleation and growth. Fluid flow in molten metal systems. Lecture, three hours. Prereq: CME 220. *Skaggs.*

461 *Physical Metallurgy II.* (3) I, II

High purity metals, nuclear alloys, powder metallurgy techniques. Lecture, 2 hours; laboratory, 3 hours. Prereq. or concur: MET 361. *Staff.*

463 *Structure of Alloys II.* (3) II

Age hardening and diffusion in metal systems. Laboratory concerned with senior thesis type problems. Lecture, two hours; lab, three hours. Prereq: MET 363. *Staff.*

521 *The Casting of Metals.* (3) I, II

Ferrous and non-ferrous foundry practice. Theory and metallurgy of metal castings. Application of engineering principles to the design and production of castings. Lecture and recitation, three hours. Prereq: MET 301 or 303. *Duncan.*

531 *Powder Metallurgy.* (3) I, II

Study of the principles of powder metallurgy relating to alloys of unusual compositions, metal and non-metal combinations, porous and laminated products, composite metals, and high-melting alloys. Lecture and recitation, three hours. Prereq: consent of instructor. *Swift.*

532 *Materials Science I.* (3)

Modern ideas on the engineering properties of solids. Crystallography; properties; relation of properties to structure; thermodynamics; solid state reactions. Prereq: Consent of instructor. *Staff.*

535 *Advanced Mechanical Metallurgy I.* (3) I, II

Elastic and plastic deformation of metallic crystalline solids; crystallographic nature of slip and twinning; work hardening, fracture and recovery. Lecture and recitation, three hours. Prereq: Consent of instructor. *Gillis, Conrad, Sargent.*

536 *Ceramic Engineering.* (3) I, II

The nature of ceramic materials. The forming and thermal treatment of ceramic products. Consideration of the various properties usually encountered and required of ceramic materials inclusive or cements. Lecture and recitation, three hours. Prereq: consent of instructor. *Leipold.*

539 *Nuclear Metallurgy.* (3) I, II

The metallurgy of such materials as are used in the various components of nuclear reactors with special emphasis on their physical metallurgy, Scientific principles in their broadest sense are emphasized. Material applicable to nuclear-reactor components in the ceramics, metal-ceramics, and other fields. Prereq: B.S. in Metallurgical Engineering or consent of instructor. *Mateer.*

550 *Corrosion.* (3) I, II

The fundamental principles of corrosion control and the basic mechanisms related to a better understanding of the causes of corrosion. The application of principles to practical situations. Lecture and recitation. three hours. Prereq: consent of instructor. *Staff.*

551 *Advanced Chemical Metallurgy I.* (3)

Study of reactions occurring during refining, based on principles of thermodynamics and kinetics. Examples from both ferrous and non-ferrous metallurgy. Lecture and recitation, three hours. Prereq: consent of instructor. *Skaggs.*

566 *Crystallography & X-ray Metallography.* (4) I, II

Elements of crystallography, nature of x-rays, diffraction by crystal lattice, the structure factor and crystal structure determinations in metallic lattices, x-ray camera and diffractometer techniques and application of these to determination of phase diagrams, preferred orientation and residual stresses. Lecture, three hours; lab, three hours. Prereq: MET 361. *De Angelis.*

632 *Materials Science II.* (3) I, II

Continuation of MET 532. Classification of solids; atomic structure and bonding, relation of structure to properties; deformation behavior and failure. Prereq: MET 532. *Staff.*

633 *Special Purpose Alloy Steels.* (3) I, II

Fundamental principles of the more complicated and special alloy steels and their heat treatment. Carbon, mild alloy, N.E., S.A.E., tool and super alloys are included. Alternate alloy steels for application are considered. Lecture, three hours. Prereq: consent of instructor. *Staff.*

635 *Advanced Mechanical Metallurgy II.* (3) I, II

Theory of dislocations in crystals and their role in strength, plasticity, work hardening and fracture of crystalline solids. Lecture and recitation, 3 hours. Prereq: MET 535. *Conrad, Gillis, Sargent.*

637 *Materials Engineering.* (3) I, II

Various factors in specification and testing of materials. Materials for lightweight construction, mechanical and electrical applications, and severe service conditions are treated. Material failures, trouble shooting, and testing are discussed. Lecture, two hours; lab, three hours. Prereq: Consent of instructor. *Staff.*

641 *Advanced Production Metallurgy.* (3) I, II

Principles and practices used in the production of alloys with special stress upon any particular group of alloys that the student may choose. Reference reading and laboratory work are emphasized. Lecture, two hours; lab, three hours. Prereq: consent of instructor. *Swift.*

650 *Advanced Chemical Metallurgy II.* (3) I, II

Study of reactions of materials with chemical environments. Introduction to irreversible thermodynamics. Emphasis on current literature. Prereq: MET 551. *Skaggs.*

659 *Advanced Phase Diagrams.* (3) I, II

Review of thermodynamic fundamentals and application to binary pressure-temperature-composition diagrams. Construction and interpretation of ternary temperature-composition diagrams. Review and discussion of important ternary diagrams. Lecture and recitation, three hours. Prereq: MET 451 or equivalent. *Staff.*

661 *Advanced Physical Metallurgy I.* (3) I, II

Study of the theory of phase transformations in metallic systems. Analysis of rate controlling processes for nucleation and growth controlled phase changes and for order-disorder reactions. Prereq: MET 463 or permission of instructor. *Morris, Staff.*

662 *Advanced Physical Metallurgy II.* (3) I, II

Solidification theory and mechanisms. Diffusion in solids. Prereq: MET 661 or permission of instructor. *Morris, Staff.*

663 *Theoretical Structural Metallurgy.* (3) I, II

Interatomic forces of crystal bonding; free electron; zone theory; equilibrium and rate of approach thereto; thermal behavior, structure and free energy of alloy phases; equilibrium diagrams; diffusion; order-disorder change, nucleation and phase growth. Lecture, three hours. Prereq: MET 461. *Staff.*

666 *Diffraction Methods in Metallurgy.* (4)

Application of thin foil electron transmission methods to the study of the defect structure of metals, theory of electron diffraction contrast phenomena, sample preparation, x-ray theory and methods applied to the study of deformation characteristics of metals, order-disorder transformations, and crystal structure analysis. Prereq: MET 566. *De Angelis.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Staff.*

771 *Seminar.* (0) I, II

Review of current literature in the field of metallurgical engineering and presentation of papers thereon. Presentation of talks on departmental research. Group and panel discussion. Required of all graduate students every semester. *Staff.*

781 *Special Problems, Literature and Laboratory.* (1-3) I, II, S

Literature research and planning of research programs; shop problems and technical writing, including a term paper, are required. Consultation, lab, and lecture by appointment. May be repeated to a maximum of nine credits. *Staff.*

782 *Special Problems, Literature and Laboratory.* (3) I, II

A continuation of MET 781, lab, 6 hours; consultation and lecture by appointment. May be repeated to a maximum of nine credits. *Staff.*

VI. MEDICINE

ANATOMY

The program of graduate studies in Anatomy is intended to provide educational opportunities for people with several different objectives. Some students will pursue graduate work in Anatomy with the intention of teaching in departments of anatomy; some will have already obtained a professional degree, such as an M.D. or D.M.D., and may be interested in obtaining specific training in some region or system of the body to complement their professional education. Others may study in Anatomy as a minor or simply for specific credit.

Preparation for graduate work in anatomy should include some coursework in biological science along with other grounding in the sciences to the minimal extent of coursework in quantitative analysis and organic chemistry, a term of calculus, and a year of college physics. Students with deficiencies in any of these areas may be admitted, but will be expected to complete their background early in the course of their graduate studies.

The Department is prepared to offer the M.S. and Ph.D. degrees with major training in gross human anatomy, microscopic human anatomy, embryology, endocrinology, genetics, and neuroanatomy. Also, a major interest can center in tissues, organs, regions or systems of the body, in which, for example, professional graduates such as dentists or orthopedic surgeons might wish to take specific training. Certain students with special needs will, with permission of the Director of Graduate Studies, be permitted to work toward the M.S. degree on Plan B; however, in most cases students will follow Plan A.

Potential applicants for graduate work in Anatomy are requested to write directly to the Chairman of the Department of Anatomy.

503 *Independent Work in Anatomy.* (3)
Reading and laboratory work in a defined area of anatomy are carried out under the direct supervision of one staff member. Hours of discussion and lab work by individual arrangements. May be repeated to a maximum of 12 credits. Prereq: An introductory course in Biology, Zoology, or Botany and permission of chairman. *Staff.*

511 *Introduction to Anatomy.* (4)
The principles of organization of the human body are presented. Several methods of studying anatomy are utilized. Gross anatomy lectures follow a systemic development. Other methods include radiology, palpation of living structures, *in vivo* microscopy, and the demonstration of prosected fresh and fixed materials and dissection. Prereq: Some background in biology, including one or more of such courses as biology, zoology, botany, comparative anatomy or embryology, and consent of instructor. *Cotter and Staff.*

512 *Microscopy and Ultrastructure.* (3)
The organization of cells, tissues and organs are presented through lectures and in the laboratory, through the microscopic study of *in vivo* materials, histological sections, and illustrations. Prereq: Some background in biology, including one or more of such courses as biology, zoology, botany, comparative anatomy or embryology, and consent of instructor. *N-Winer, Traurig, and Staff.*

513 *Developmental Anatomy.* (2)
The development of the human body is presented through lectures, visual aids including motion pictures, histological sections, laboratory demonstrations and exercises. A majority of the time is spent on intra-uterine development; however, postnatal growth and common morphological changes associated with aging are also taken up. Prereq: Some background in biology, including one or more of such courses as biology, zoology, botany, comparative anatomy or embryology, and consent of instructor. *Fowler and Staff.*

516 *Anatomy of the Nervous System.* (3)
The gross and microscopic structure of the central and peripheral nervous systems and their blood supply will be studied. The course will include the functional interpretation of anatomical structures. Prereq: ANA 511, 512, 513; PGY 511; consent of instructor. *Gillilan and Staff.*

529 *Concepts of Morphology.* (2)
The objective of this course is to present concepts of morphology as they concern cells, tissues, or organs, systems and/or regions of the human body. Necessarily, the history of the development of ideas about the selected topic will be surveyed. Inherent also in the presentation of concepts of structure will be the presentation of controversies which have resulted from differing methods and interpretations. Prereq: Advanced work in biology, preferably a major or minor in a biological science, and consent of the staff. May be repeated once. *Staff.*

531 *Combined Gross and Neuroanatomy.* (6)
The course includes a presentation of principles and generalizations about the morphology of the human body and several techniques for studying gross and neuroanatomy of the head, neck, and thorax. Neuro and gross anatomy will be given 3 hours of lab work. Dissection guide, texts, atlases and original articles will be assigned. Prereq: Some background in biology and consent of instructor. *Fowler and Staff.*

532 *Combined Histology and Embryology.* (4)
The course includes the microscopic study of tissues and organs of the human body and the general development of the human embryo and fetus, with emphasis placed upon the development of head, neck, and face. Texts and additional literature references are assigned. Prereq: Some background in biology and consent of instructor. *Elwood and Staff.*

533 *Oral Histology.* (2)
A detailed study of the microscopic organization and ultrastructure of the several gross structures of the oral cavity and tooth development. Texts and original articles are assigned. Discussion will be carried out within the laboratory periods. Prereq: ANA 531 and 532, or their equivalent, and consent of instructor. *Elwood and Staff.*

611 *Regional Gross Anatomy.* (8)
The course will include 1) a detailed dissection of the human body 2) a study of specific relations of the systems within major regions 3) a familiarization with reference sources in the field of gross human anatomy. Prereq: Courses in Comparative Anatomy and Embryology and ANA 511 or the equivalent and consent of instructor. *Benton and Staff.*

629 *Techniques of Anatomical Research.* (2)
The objective of this course is the familiarization of students with research techniques in anatomy. The relationship will be tutorial. Students will work under the direction of given staff members for determined periods of time, usually on a problem. The exact length of time will depend upon the student's purposes, progress and the techniques. The problem may be new research or a repetition of previous work. Prereq: Previous senior college or graduate level work in biology and consent of chairman. May be repeated once. *Staff.*

631 *Advanced Gross Anatomy.* (3-5)
The objective of this course is to meet individual student needs for increased knowledge in particular areas of gross human morphology. Investigations of problems involving gross morphology will be carried out. One or several defined areas of the body will be studied in considerable detail by dissection, by intensive use of the pertinent literature, by the use of visual aids, prosected materials and other appropriate learning aids. Prereq: A background in gross human anatomy equivalent to a medical school course in regional anatomy and consent of instructor. May be repeated at discretion of student's committee. *Benton and Staff.*

633 *Advanced Developmental Anatomy.* (2-5)
The objectives of the course include a detailed study of the intrauterine development of the human fetus as well as of fetal physiology and comparative aspects of gestation. Prereq: Comparative Anatomy, Embryology, and consent of the instructor.

634 *Advanced Endocrinology.* (2-5)
The objectives of this course include interrelating the microscopic and ultrastructural morphology of endocrine glands with the functions of these glands. Emphasis will be placed on functional aspects, chemistry, and mode of action of specific hormones. All endocrine organs will be studied and given equal importance. The relationship between the central nervous system and the endocrine system will be covered in detail. Prereq: Fundamental background in biology including some previous work in endocrinology and consent of the instructor. *Winer and Staff.*

636 *Advanced Neuroanatomy.* (3-5)
The objectives include specific and detailed correlation of anatomical materials with clinical data particularly in the areas of the sub-specialties of Neurology, Psychiatry, Ophthalmology, Otolaryngology, Internal Medicine, and Neurosurgery. Clinical data from these sub-specialties will be related to the location of neuclei, the precise patterns of fiber tracts and to blood supply. The detailed content and emphasis will depend upon both the background and the purposes of the student. Prereq: ANA 511, 512, 513, 516, or their equivalent and consent of instructor. *Gillilan and Staff.*

638 *The Genetic Basis of Human Morphology.* (2-5)
The course will provide an historical survey of human genetics as background for current concepts. The genetics of man will be studied together with the problems of data gathering which are unique and are inherent in this field. The interrelations of known errors of human metabolism to alterations of cell and system morphology will be presented. Prereq: Elementary Genetics and consent of instructor. *Cotter.*

651 *Special Projects in Anatomy of Head and Neck Correlated with Neuroanatomy.* (3-5)
The objective of the course is to provide the opportunity for the learning of detailed information about gross anatomical relations in the head and neck. Prereq: A course in regional gross anatomy and neuroanatomy and consent of instructors. *Gillilan, Benton, and Staff.*

662 *Ultrastructural Anatomy.* (2-5)
The objectives of this course are to advance the students' knowledge of the mammalian tissues and the human body. Those students registering for more than 2 hours of credit will do advanced laboratory work in electron microscopy and micro-radiographic techniques. Correlation of intra- and extra-cellular morphology and function will be stressed. Prereq: Previous work in microscopy including histology or cytology and previous technique work with microbiology, and consent of instructor. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

BEHAVIORAL SCIENCE

The Concentration and the Minor in Medical Behavioral Science

A program of concentration or a minor in medical behavioral science is offered for doctoral candidates in sociology, anthropology, psychology or other

behavioral science disciplines through the Department of Behavioral Science in the Medical Center. The concentration has three objectives:

I. An orientation to the several behavioral sciences; to their areas of overlap and interrelation as well as to their discrete contents, theories and methods.

II. An orientation to medical settings, including an enculturation to the social structure, attitudes, beliefs, values and objectives of health personnel and organizations, and the nature of behavioral science research in these areas.

III. Research training, designed to afford each student an opportunity to learn the basic skills and approaches to research design, data acquisition, and data analysis, through personalized, supervised participation in one or more research projects. Such training is arranged to include experimental, survey, and case-study methods, to insure the integration of research training with a student's program of courses and to culminate in a health-related topic for the doctoral dissertation. As far as possible, students in the concentration are provided office space in the Medical Center so that they may have ready access to resources and events.

Students may elect to minor in medical behavioral science by taking a group of approved courses with the sponsorship and guidance of a designated faculty member.

The concentration is partially supported by a training grant from the National Institute of Mental Health for Research Training in the Social Sciences, under which selected students are provided with traineeship stipends.

Courses for the concentration include:

546 *Social Factors in Mental Health.* (3)
The significance of social and cultural factors in the recognition, course, and management of mental health problems; social organization of the mental hospital and cultural alternatives to hospitalization. Prereq: Consent of instructor; SOC 101. (Same as SOC 546.) *Gallagher.*

670 *Seminar on Role Theory.* (3)
An exploration of differences and similarities in the utilization of the concept of role in sociology, anthropology and psychology. Emphasis is placed on the potentiality of role as a unifying concept in the behavioral sciences. Prereq: Consent of instructor; SOC 101. (Same as SOC 670 and ANT 670.) *Hall and Gallagher.*

765 *Research Problems in Medical Anthropolgy.* (3)
History and theory of medical anthropology; research design, field work, analysis of data, and report writing. Prereq: Graduate status in ANT, SOC or PSY, *and* a concentration or minor in medical behavioral science. Two class hours, three laboratory hours per week. (Same as ANT 765.) *Pearsall.*

766 *Concepts in Medical Sociology.* (3)
A systematic review of sociological concepts and methods which have been applied to the study of health and medicine; the contributions of medical sociology to general sociological theory; the roles of sociology in education for the health professions and in research on health-related problems of society. Two class hours, four laboratory hours per week. Prereq: Predoctoral status in one of the social or behavioral sciences with a concentration or minor in medical behavioral science; SOC 101. (Same as SOC 766.) *Straus.*

772 *Topical Seminar in Medical Behavioral Science.* (1-3)
Advanced study of topics of current importance in medical behavioral science such as alcoholism, social psychological processes related to health, social structure of mental hospitals, social epidemiology of disease, institutional dependency, computer-aided medical diagnosis. May be repeated to a maximum of 6 credits. Prereq: consent of instructor. *Staff.*

790 *Research in Medical Behavioral Science.* (1-6)
Individually directed research and reading in particular aspects of medical behavioral science under the supervision of one or more members of the faculty. By appointment. Prereq: For students taking a concentration or a minor in Medical Behavioral Science as part of their doctoral programs or as elective for graduate, medical or dental students. *Staff.*

ALSO AVAILABLE IN THE DEPARTMENT OF BEHAVIORAL SCIENCE

527 *Society and Health.* (3)
The study of human behavior in illness and of medicine as a complex form of social organization in perspective of historical, cross-cultural and contemporary analysis. This course is designed primarily for students preparing for careers in an allied health science and profession. (Same as SOC 527.) Prereq: SOC 101. *Hall.*

BIOCHEMISTRY

The program of graduate studies in biochemistry is designed primarily for doctoral candidates who plan to pursue a research career in this field. Creative research in biochemistry requires broader training and more extensive laboratory experience than can be achieved at the master's level. Therefore, candidates for the master's degree will be accepted only under unusual circumstances.

As preparation for graduate work in biochemistry, students should have completed courses in chemistry through physical chemistry, in mathematics through the calculus and must have had one year of work in physics and in one of the biological sciences. A reading knowledge of two modern foreign languages, of which one should be German and the other French or Russian, should be acquired as an undergraduate. Although students who have deficiencies in their preparation may be admitted to graduate study in the Department of Biochemistry, the time necessary for completion of their work will necessarily be lengthened. Although programs of study will be fitted to the preparation and interests of individual students, it is anticipated that most students will take advanced courses in chemistry and in physiology, cell biology, microbiology, zoology or botany.

Inquiries concerning availability of financial support for graduate students should be addressed to the chairman of the department.

501 *Biochemistry for Dental Students.* (6)
This is a course in general biochemistry in which particular emphasis is given to those aspects of the field which are of interest to students of dentistry.

511 *Biochemistry for Medical Students.* (7)
A selective summary of available information on cellular activities at the molecular level. Particular emphasis will be given to the processes by which metabolites are converted into compounds essential to the maintenance or growth of the cell or are oxidized to yield energy in a form which is useful to the cell. Discussions of respiration, nutrition and of the processes by which a constant extracellular environment is maintained are also included. Prereq: CHE 104, 112, 232; CHE 442 is also highly desirable; ZOO 100; permission of chairman. *Staff.*

514, 515 *General Biochemistry.* (3 ea.) I
An intensive introductory course in the broader aspects of biochemistry. Topics stressed include the chemistry of naturally occurring materials, the nature of enzyme action, intermediary metabolism, and chemical aspects of the specialized behavior of animals, plants and microorganisms. Prereq: CHE 112, 222, 232 and one year of biological science. CHE 442 and 443 are desirable for students majoring in biochemistry but may be taken concurrently. *Staff.*

517 *Experimental Methods in Biochemistry.* (2)
A laboratory course dealing with the procedures and instruments of biochemical research. Each technique is employed in the course of a classical experiment demonstrating an important biochemical finding. The course is designed to accompany BCH 514, 515 and may be taken concurrently with BCH 515 during the second semester or in the following year. Because the materials employed are labile, one full day per week is spent in the laboratory. Prereq: BCH 514 or its equivalent.

610, 611 *Intermediary Metabolism.* (3 ea.) I, II
A lecture and seminar course devoted to a study of the detailed mechanisms of carbohydrate, lipid and nitrogen metabolism. Prereq: BCH 511 or 514, 515. *Lester, Bollum.*

614, 615 *Biochemistry of Proteins, Nucleic Acids and Enzymes.* (3 ea.) I, II
A lecture and seminar course devoted to the chemical, physical and biological properties of proteins, and nucleic acids and to the broad area of physical biochemistry including kinetic and thermodynamic aspects of enzyme-catalyzed reactions. Prereq: CHE 442, BCH 511 or 514, 515. *Schwert, Hu.*

618, 619 *Seminar in Biochemistry.* (1 ea.) I, II
A weekly seminar, required of all students majoring in biochemistry, and devoted to discussions of areas not covered in other courses and to recent developments in the field. *Staff.*

640 *Research in Biochemistry.* (1-15) I, II, S
Prereq: Permission of instructor. *Staff.*

769 *Residence Credit for the Doctor's Degree.* (1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

PATHOLOGY

While there is as yet no graduate program in pathology the department offers two courses which are open to qualified graduate students. The permission of the department chairman is required prior to enrollment.

421 *Fundamental Human Pathology.* (4)
This course will provide a general survey of the various types of reactions to injury, regeneration, repair, the granulomata and the fundamentals of neoplasia. The emphasis will be upon the pathogenesis, mechanisms, and natural history of disease processes with particular stress on the interrelationships of structural and metabolic abnormalities. For non-medical students. Prereq: For graduate students: ANA 511, 512, 513, PGY 511, BCH 511 or equivalent, and permission of chairman.

422 *Systemic Human Pathology.* (7)
The study of diseases of each organ system. For non-medical students. Prereq for graduate students: ANA 511, 512, 513, PGY 511, BCH 511 or equivalent. Permission of department chairman.

PHARMACOLOGY

The Department of Pharmacology offers M.S. (according to Plan A) and Ph.D. degree in Pharmacology.

Pharmacology is the study of the actions of drugs upon living matter. Pharmacologists in modern society find careers as teachers in academic profes-

sions, as scientists engaged in research of problems related to pharmacology, and in developing new drugs along with evaluating drugs for their potential efficacy, toxicity, side effects, etc.

Graduates from accredited colleges with bachelor degrees in the biological sciences, in chemistry, physics or pharmacy or with professional degrees in medicine, dentistry, veterinary medicine or pharmacy are eligible for candidacy for graduate degrees in pharmacology. It is advisable that the candidates obtain a good basic training in mathematics, physics, chemistry and biological sciences. The Ph.D. program involves extensive research work under the supervision of appropriate staff scientists. At the present, special training can be obtained in fundamental pharmacodynamics, in neuropharmacology, psychopharmacology, and in gnotobiotic biology.

Only one modern foreign language is required for the Ph.D. degree in Pharmacology.

Inquiries concerning the details of the program as well as possible financial support for graduate students should be addressed to the Chairman of the Department of Pharmacology.

521 *General Pharmacodynamics.* (2) I

A fundamental discussion of the response of the living organism to drugs analyzed primarily on the cellular and subcellular levels. Factors which affect the absorption, distribution and the disposal of drugs in the body will be discussed. The quantitative aspects of dose-response relationships to drugs will be analyzed including an introduction to the problems of biological assay. Prereq: consent of instructor. *Csaky and Staff.*

522 *Pharmacology in Medicine.* (3) I

Aimed to give a fundamental understanding of the pharmacodynamic action of drugs most commonly used in medical practice. Prereq: PHA 521; consent of instructor. *Csaky and Staff.*

541 *Biological Assay.* (3) I

A study of the estimation of potencies of treatments against some standardized scale. Prereq: Consent of the department chairman. *Staff.*

555 *Gnotobiotic Methodology.* (2)

A practical course for students who wish to learn how to conduct gnotobiotic experiments. In this type of work animals are maintained either in absence or in association with known microbial contaminants. Prereq: MB 200. Consent of instructor. *Gordon.*

610 *Seminar in Pharmacology.* (1) I, II

May be repeated indefinitely. *Staff.*

612 *Quantitative Pharmacodynamics.* (2)

Quantitative treatment of dynamics of drug absorption, distribution, metabolism and excretion, including development of mathematical models for these processes and application of techniques such as analog simulation. (Same as PHR 612.) Prereq: PHA 521 and consent of instructor.

621 *Advanced Pharmacodynamics.* (2) I

Continuation of PHA 521 with particular emphasis on recent developments in the field. Prereq: PHA 521, and consent of the Department Chairman. *Staff.*

631 *Pharmacological Methodology.* (3) II

Practical review of the important specialized methods in study of the effects of drugs. Prereq: PHA 521, 533, and consent of the Department Chairman. *Staff.*

645 *Physiology and Pharmacology of Biological Membranes and Transport.* (1)
Advanced study of the structure, functions, and permeability of biological membranes and the effect of change of chemical environment upon them. Prereq: BCH 514/515 or PCH 400 or CHE 552 or equivalent. PGY 502/503 or 511 or equivalent. PHA 521. Consent of instructor. *Csaky.*

650 *Host-Contaminant Relationships.* (2)
The course deals with the effects of microbial associates on various systems of the animal host with special reference to gastrointestinal, cardiovascular, defensive functions and aging. Material will be presented as a comparative study between gnotobiotic and conventional animals. Prereq: BSC 421/422, CHE 220, 230, 444, ZOO 200, MB 200, 550 or equivalent. Consent of instructor. *Gordon.*

658 *Advanced Neuropharmacology.* (4)
A study of the general theories of the mode of action of drugs upon nervous tissue and a review of the effects of analgesics, sedatives, hypnotics, anesthetics, tranquillizers, psychotomimetics, analeptics, antidepressants, anticonvulsants and drugs affecting motor dyskinesias upon neurones, synapses and functional components of the central nervous system. Prereq: PGY 416 or equivalent, PHA 521 and 522; consent of instructor. *Martin.*

660 *Pharmacology of Steroids.* (4) II
Lectures and laboratory work dealing with the chemistry, metabolism and pharmacology of steroids. Emphasis will be placed on methods of research which will be illustrated in laboratory exercises. Prereq: CHE 232, BCH 514/515 or PCH 400 or CHE 522 or equivalent. PHA 521. Consent of instructor. *Flesher.*

664 *Advanced Molecular Pharmacology.* (2) II
An advanced discussion of actions of drugs at the molecular level. The mechanism by which drugs alter the biochemical machinery which operates in the maintenance in the cellular integrity will be emphasized. Chemical events which occur when drug molecules interact with macromolecules with cell constituents which modulate the activities of cells will be discussed. Prereq: PHA 521; consent of instructor. *Diedrich.*

665 *Drug Receptor Interrelationship.* (1)
A seminar course in which the nature and topography of the reactive groups constituting the receptors of various drugs is discussed. Prereq: CHE 550/552 or BCH 514/515 or equivalent, PHA 521 and 522. Consent of instructor. *Diedrich.*

670 *Clinical Psychopharmacology.* (2)
Purposes, indications and contraindications, methods of administration and effects of psychotropic drugs on human behavior. Prereq: PHA 521, 522, PSY 210, 330, and 336 or equivalent and consent of Director of Graduate Studies in Pharmacology.

671 *Integrative Psychopharmacology.* (2)
Mechanism of action of psychotropic drugs. Prereq: PHA 521, 522, PSY 210, 330 and 336 or equivalent and consent of Director of Graduate Studies in Pharmacology. PSY 505 and 507 or 509, PGY 516, ANA 516 and PHA 670 are strongly recommended.

680 *Applied Toxicology.* (5)
The course will acquaint students with the various toxicological principles as they apply to problems arising from the complexities of modern society. Lectures, demonstrations, and informal discussions. Lecture, 5 hrs. per wk. (Offered as a conjoint course.) Prereq: Consent of the Director of Graduate Studies in Toxicology.

750 *Research in Pharmacology.* (1-5) I, II, S
May be repeated to a maximum of 15 credits. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

770 *Seminar in Toxicology.* (1)
One class hour per week. Prereq: Consent of Director of Graduate Studies in Toxicology.

790 *Research in Toxicology.* (1-5)

PHYSIOLOGY AND BIOPHYSICS

Physiology is the biological field concerned with function. It is, in fact, dynamic biology. The increase in knowledge in the field of physiology as well as the change in the nature and complexity of instrumentation necessary for experimentation and analysis of experimental data have lengthened doctoral programs in physiology or necessitated a restriction in the scope of the program.

The graduate program meets these problems in three stages:

(1) requirement of adequate physical, chemical and biological background before admission to the program or a reasonable plan to make up deficiencies that exist. In general, one year of physics, three years of chemistry, one year of biological science and mathematics through calculus are required. A reading knowledge of one modern foreign language is required of candidates for the Ph.D. degree;

(2) a basic program covering one to two years to allow instruction in basic mammalian and cellular physiology and the correlated instrumentation including project type laboratory work;

(3) special training and research including a thesis in the areas of physiology in which the department has competence. These include neurophysiology, cardiovascular physiology, respiratory physiology, temperature regulation, developmental physiology, cellular physiology, physiological correlates of behavior. Special programs may be developed in biophysics, space physiology, and biomedical engineering.

In general, the physiology studies program is designed primarily for the doctoral candidate. Today's research in physiology requires broader training than can be achieved at the master's level. Therefore, candidates for the master's degree (Plan A) will be accepted only under special circumstances. Graduates of accredited colleges with a bachelor's degree in biology, zoology chemistry, physics, psychology, or engineering may become candidates for a graduate degree in physiology. math,

Inquiries concerning availability of financial support should be addressed to the Chairman of the department.

502 *Principles of Physiology Lectures.* (3) I
A comprehensive discussion of physiology using advanced texts and library reading; includes function as related to major body systems. Three hours lecture. (Same as ZOO 502.) Prereq: One year Physics and Organic Chemistry. *Staff.*

503 *Principles of Physiology.* (5)
A comprehensive discussion of physiology using advanced texts and library reading; includes function as releated to major body systems and laboratory experience with major experimental techniques. Prereq: One year physics and organic chemistry. (Same as ZOO 503.)

504 *Independent Work in Physiology.* (2-4) I, II, S
A study of some advanced problems in physiology under the direct supervision of the instructor. Discussion period, one hour; lab, four hours. May be repeated to a maximum of 8 credits. Prereq: Instructor's consent. *Staff.*

507 *Introduction to Endocrinology.* (3) I, S
Introductory study of the development, structure and fundamental functions of endocrine glands. Lectures, three hours. Prereq: general chemistry, instructor's consent. *Archdeacon.*

510 *Medical Physiology Lectures.* (4)
Provides advanced work in mammalian physiology approach from a biophysical point of view. Lectures and small group discussions will include consideration of cellular function, excitable tissues, volume conductors, contractile tissues, circulation, respiration, gastrointestinal tract, energy exchange, kidney and mid brain control systems. Four class hrs. per wk.

511 *Medical Physiology.* (7)
The instruction in physiology will provide advanced work in mammalian physiology approached from a biophysical point of view. Lectures and small group discussions will include consideration of cellular function, excitable tissues, volume conductors, contractile tissues, circulation, respiration, gastrointestinal tract, energy exchange, kidney and mid brain control systems. Laboratory experience will also include electrophysiological techniques and mammalian surgical techniques with emphasis on experimental design and biometrics. Prereq: Admission to medical school or permission.

512 *Cellular Physiology.* (4) I
An intensive study of general physiological principles with emphasis on the chemistry and physics of the cell. Lecture, two hours; lab, 2 hours. Prereq: Physics and General Chemistry. *Staff.*

513 *Cellular Physiology Lab.* (0)
Laboratory for PGY 512.

522 *Mathematical Biophysics.* (3) I
Mathematical approaches to biophysical problems in biology. Emphasis on the abstract representation of physiological systems and processes. Three class hours per week. Prereq: MA 114 or equivalent. *Engelberg.*

602 *Physiological Instrumentation I.* (3) I
Electronic circuits in physiological measuring systems. Prereq: MA 113, knowledge of integration and differentiation of simple functions or permission of instructor.

603 *Physiological Instrumentation II.* (3)
Physical basis of physiological measurement and analogs of physiological systems. Three lectures per week. Home assignments will emphasize problem-solving and will include a term problem to be selected by the student in consultation with the instructor. Topics to be covered in this course include: non-linear electronic circuits; transducers; synthesis of instrumentation systems; and analogs of biological and mechanical systems. Prereq: MA 113, PGY 511, PGY 602 or consent of instructor.

606 *Advanced Neurophysiology.* (3) II
Electrical analysis of nerve fibres and synapse; nerve impulse theories, reflexes, metabolism and central nervous function are considered from the cybernetic viewpoint. Lectures, two hours; lab, two hours. Prereq: PGY 512, 513; instructor's consent. *Boyarsky.*

607 *Advanced Neurophysiology Lab.* (0)
Laboratory for PGY 606.

620 *Theoretical Biophysics.* (3)
Study of applications of mathematical techniques used in modern theoretical biophysics to physiological problems. Emphasis on abstract presentation of physiological systems and processes. Prereq: MA 113, PGY 502 or 512 or BOT 501.

630 *Advanced Topics in Physiology and Biophysics.* (2)
Contemporary topics in physiology and biophysics. Course designed to utilize the special research interests of resident and visiting faculty. May be repeated to a maximum of six credits. Prereq: PGY 503 or 511, or consent of instructor.

660 *Systems Biophysics.* (3) II
The development and analysis of models of physiological systems. Applications of probability theory, spectral analysis, transient and frequency analysis to these systems. Prereq: PGY 522, MA 114 or equivalent or consent of instructor.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits or equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
Staff.

774 *Graduate Seminar in Physiology.* (1) I, II, S
Staff.

791 *Research in Physiology.* (2-5)
May be repeated to a maximum of 15 credits.

THERAPEUTIC RADIOLOGY

545 *Radiation Hazards and Protection.* (2)
An analysis of common radiation hazards encountered in medicine and research, regulations for safe usage of radiation, and procedure for safe use of radiation. One class hour, two laboratory hours per week. Prereq: College physics; one year biology.

TOXICOLOGY

The Graduate Program in Toxicology is interdepartmental with members and the College of Agriculture participating. The program is co-ordinated by the Department of Pharmacology and the Chairman of that Department acts as Director of Graduate Studies. Both the M.S. (Plan A) and Ph.D. degree are offered.

It is designed to train individuals to utilize the biological, physical, and mathematical sciences in the study of the causes, mechanisms, and evaluation of poisoning as well as the sources, identification and quantitation of poisons. Toxicology, the science of poisons, is concerned with the interaction of chemical agents or changes in the physico-chemical environment with living systems.

Graduates of accredited colleges with baccalaureate degrees in the biological sciences, chemistry, or physics or professional degrees in medicine, dentistry, veterinary medicine and pharmacy, may apply for graduate study in the toxicology

program. It is advisable that candidates have a good background in chemistry, physics, biological sciences, and mathematics. Students with other advanced degrees may be considered for admission. However, the number of credits and courses transferable will be considered on the merits of each individual case.

Since each candidate may be expected to have specific interests, the actual curriculum will be tailored to meet individual needs. Only one modern foreign language is required for the Ph.D. degree in Toxicology.

Inquiries concerning the details of the program as well as possible financial support for graduate students should be addressed to the Chairman of the Department of Pharmacology, College of Medicine.

MM 620 *Biotoxicology.* (3 or 5) I

An advanced course in toxicology and toxicodynamics concerned with the sources, isolation, purification identification as well as the physiologic effects on man, animals, and plants of the various toxic substances encountered in the occupations, home, as well as rural and urban environments. Special attention will be given to type compounds as well as structure-activity relationships. Lecture, three hours; lab, four hours. Prereq: BCH 514, 515, CHE 532, PHA 521, and PGY 503 or MM 334 and 346; or consent of instructor. *Luckens.*

MM 630 *Biotoxicology.* (3 or 5) II

A continuation of MM 620. Prereq: MM 620 or permission of the instructor. *Luckens.*

MM 640 *Environmental Toxicology and Occupational Hygiene.* (3) II

An advanced course concerned with the recognition, analysis, evaluation, and control of the physical, physiologic, and toxicologic factors arising from occupational and natural environments; their effects on the well-being of the worker and the community; and current practices in their recognition, elimination and/or mitigation. The occupational environment will be considered as a special case of the ambient environment. Special attention will be given to the development of design data for practical problems. Lecture, three hours per week. Prereq: MM 620, 630 or permission of the instructor. *Luckens.*

PHA 680 *Applied Toxicology.* (5) I

The course will acquaint students with the various toxicological principles as they apply to problems arising from the complexities of modern society. Lectures, demonstrations and informal discussions. Lecture, five hours per week. Prereq: Consent of the Director of Graduate Studies in Toxicology. (Offered as a Conjoint Course.) *Conjoint Staff.*

PHA 770 *Seminar in Toxicology.* (1) I, II

Prereq: Consent of Director of Graduate Study in Toxicology. *Conjoint Staff.*

PHA 790 *Research in Toxicology.* (1-5) I, II, S

Conjoint Staff.

PHA 768 *Residence Credit for the Master's Degree in Toxicology.* (1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Conjoint Staff.*

PHA 769 *Residence Credit for the Doctor's Degree in Toxicology.* (1 to 12 credits equivalence)

May be repeated indefinitely. *Conjoint Staff.*

VII. PHARMACY

PHARMACEUTICAL SCIENCES

The College of Pharmacy offers M.S. and Ph.D. programs in Pharmaceutical Sciences, with areas of concentration in either Pharmaceutics (Physical Pharmacy or Biopharmaceutics) or Pharmaceutical Chemistry (Medicinal Chemistry and Pharmaceutical Analysis).

The M.S. degree is offered under a modification of Plan A which permits a student to take approximately one-half of his course work in areas outside the major area. Plan B may be employed only in exceptional cases.

The language requirement for both the M.S. and Ph.D. degrees is a reading knowledge of one foreign language chosen from French, German, or Russian.

Subject to some substitution at the recommendation of the candidate's committee, courses considered basic to the Ph.D. program are CHE 440, 442, 522, 532, 548, 633, 635, MA 481, STA 670, PHA 521, BCH 514, 515. Superimposed upon this base it is expected that the student will take graduate level courses within his major area of interest from the courses listed in the departments of Pharmacy and Pharmaceutical Chemistry.

For regular admission to graduate study in Pharmaceutical Sciences a student should have a sound background in pharmacy, chemistry, and biology, with a mastery of mathematics through calculus. Applicants lacking basic requirements in these areas will be required to make up such deficiencies by taking undergraduate courses for non-graduate credit.

PHARMACY

(Pharmaceutics)

540 *Industrial Pharmaceutical Technology.* (4)
The course is designed to give the student a basic understanding of the technology used in the preparation of the principal type of dosage forms by the pharmaceutical industry. Two class hours and four laboratory hours per week. Prerequisite, Theoretical Pharmacy or equivalent (PHR 825). *Lesshafft, Billups, Dittert.*

612 *Quantitative Pharmacodynamics. Pharmacokinetics.* (2)
Quantitative treatment of dynamics of drug absorption, distribution, metabolism and excretion, including development of mathematical models for these processes and application of techniques such as analog simulation. Two class hours per week. Prereq: PHA 521, and consent of instructor. (Same as PHA 612.) *Doluisio, Staff.*

622 *Advanced Biopharmaceutics.* (2)
An advanced treatment of the factors affecting drug availability from dosage forms and the influence of the route of administration and the dosage regimen on drug availability. Two class hours per week. Prereq: PHR 612. *Doluisio, Staff.*

630 *Pharmaceutical Processes.* (3)
Kinetics of reactions of pharmaceutical interest; mechanisms of drug decomposition and theoretical approaches to stabilization and preservation; accelerated stability analysis. Three class hours per week. Prereq: Physical Chemistry and Chemical Kinetics. *Kostenbauder.*

631 *Equilibrium Phenomena in Pharmaceutical Systems.* (3)
An advanced study in special topics of a physical chemical nature which are applicable to pharmacy, with special emphasis on physical properties and molecular structure, solubility, complexation and equilibria in solution. Three class hours per week. Prereq: Physical Chemistry. *Kostenbauder, Staff.*

632 *Pharmaceutical Disperse Systems.* (3)
The theoretical considerations basic to the technology of pharmaceutical disperse systems. Topics include colloidal dispersions, suspensions, emulsions, and rheology. Three class hours per week. Prereq: Physical chemistry. *Billups.*

760 *Topics in Pharmaceutics.* (2)
This course deals with emerging basic concepts of pharmaceutical interest that are not being covered in other courses. Two class hours per week. *Staff.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

776, 778 *Seminar in Pharmaceutics I and II.* (1 ea.)
Reports and discussion of pertinent research and literature in pharmaceutics. Prereq: graduate standing. *Staff.*

780 *Special Problems in Pharmaceutics.* (1-6)
Special problems of a laboratory or literature nature in which a student pursues a topic of interest to him. Prereq: Consent of instructor. *Staff.*

790 *Research in Pharmaceutics.* (1-12)
Research work to be conducted in various areas of pharmaceutics. Prereq: approval of student's Graduate Committee and consent of instructor. *Staff.*

PHARMACEUTICAL CHEMISTRY

400 *Biochemistry.* (4)
A fundamental course in the chemistry and inter-relationships of carbohydrates, lipids, and proteins, as well as the role of enzymes, vitamins, and harmones in psychological processes. Laboratory exercises parallel the lecture material. Lecture, three hours; lab, three hours. Prereq: PCH 302. *Glasser.*

402 *Pharmaceutical Analysis and Control.* (4)
A course which deals with the application of analytical methods in the determination of the strength, purity and quality of drugs and pharmaceuticals; and includes the means by which quality can be assured in a fabricated pharmaceutical product. Laboratory exercises include analysis of raw materials and dosage forms. Lecture, three hours; lab, three hours. Prereq: CHE 226. *Dittert.*

404 *Chemistry of Medicinal Products.* (3)
A study of the official and more important non-official medicinal agents with respect to their physical and chemical properties, relationships of chemical structure to physiological activity, as well as their potential incompatabilities. Lecture, three hours. Prereq: PCH 400 or equivalent. *Magarian.*

406 *Chemistry of Medicinal Products.* (3)
A continuation of PCH 404 including consideration of such topics as alkaloids, glycosides, steroids, and other chemotherapeutic agents. Lecture, three hours. Prereq: PCH 404. *Magarian.*

410 *Advanced Organic Pharmaceutical Chemistry.* (3)
A study of the synthesis, classification, properties, and uses of organic medicinal agents. Lecture, one hour; lab, six hours. Prereq: PCH 302 or equivalent. *Kornet.*

412 *Advanced Organic Pharmaceutical Chemistry.* (3)
A continuation of PCH 410. Lecture, one hour; lab, six hours. Prereq: PCH 302 or equivalent. *Kornet.*

510 *Modern Methods in Pharmaceutical Analysis.* (5)
Acourse which deals with the application of modern analytical methods, primarily instrumental methods, in the determination of the strength, purity, and quality of drugs and pharmaceuticals. Laboratory exercises include analysis of raw materials and finished dosage forms. Three class hours and four laboratory hours per week. Prereq: CHE 226. *Dittert.*

620 *Natural Products Chemistry.* (3)
Chemistry of natural products. A course designed to establish a bridge between organic chemistry, biochemistry and biology in terms of such areas as biogenesis, biotransformations, isolation, degradation, structure elucidation and synthesis of natural products of interest as medicinal agents. Three class hours per week. Prereq: PCH 400 or equivalent, consent of instructor. *Digenis.*

640 *Advanced Pharmaceutical Chemistry I.* (3)
Chemistry of chemotherapeutic agents. A course bridging synthetic organic chemistry and biological activity and considering those organic compounds used as therapeutic agents in infectious diseases emphasizing the synthesis, relationship between chemical structure, biological activity, molecular modification and metabolism. Three class hours per week. Prereq: Advanced Organic Chemistry and consent of instructor. *Glasser, Magarian.*

642 *Advanced Pharmaceutical Chemistry II.* (3)
Chemistry of pharmacodynamic agents. A course similar to PCH 640, but considering those agents altering physiological activity such as antihistaminics, anesthetics, antispasmodics, hypnotics, etc. Three class hours per week. Prereq: Advanced organic chemistry and consent of instructor. *Glasser, Magarian.*

760 *Topics in Pharmaceutical Chemistry.* (2-4)
(Topic and credit to be listed when offered)
A study of selected areas of pharmaceutical chemistry such as drug-protein binding, synthetic methods in drug development, heterocyclic compounds, alkaloids, steroids, flavones, etc. May be repeated for a maximum of 10 hours. Prereq: Consent of the instructor. *Staff.*

768 *Residence Credit for Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

769 *Residence Credit for the Doctor's Degree.*
(1 to 12 credits equivalence)
May be repeated indefinitely. *Staff.*

776, 778 *Seminar in Pharmaceutical Chemistry I and II.* (1 ea.)
Reports and discussion on pertinent research and literature developments in pharmaceutical chemistry. Required of all graduate students. Prereq: Graduate standing. *Staff.*

780 *Special Problems in Pharmaceutical Chemistry.* (1-6)
Selected problems of laboratory or library nature in which a student pursues a topic of interest to him under the supervision of a faculty member particularly qualified in that area. May be repeated once. Prereq: Consent of the instructor. *Staff.*

790 *Research in Pharmaceutical Chemistry.* (1-12)
Research work to be conducted in the various areas of pharmaceutical chemistry such as synthesis of medicinal agents, analytical methods for drugs, structure action relationships, and related topics. Prereq: Approval of student's Graduate Committee and consent of instructor. *Staff.*

MATERIA MEDICA

450 *Pharmacology and Toxicology.* (5)
A presentation of the pharmacodynamic actions, modes of administration, toxic manifestations of drugs, and the relationship of pharmacorynamic action to therapeutic use. Lecture, four hours; lab, two hours. Prereq: MM 334, 346, PCH 400. *Staff.*

462 *Pharmacology and Toxicology.* (5)
A continuation of MM 450. Lecture, four hours; lab, two hours. Prereq: MM 450. *Staff.*

470 *Drug Literature Evaluation.* (3)
This course appraises the student of the pharmacological and toxicological principles and techniques employed in the clinical evaluation of drugs and enables the student to use clinical literature more effectively. It is designed as a natural continuation of MM 462. Prereq: MM 462. *Staff.*

474 *Independent Problems in Toxicology.* (1-3)
Selected problems requiring literature and laboratory research aee designed to meet specific needs of graduate minors in toxicology and satisfy professional elective requirements for pharmacy students. May be repeated for total of six hours. Prereq: permission of instructor. *Luckens.*

475 *Independent Problems in Pharmacognosy.* (1-3)
Selected problems requiring literature and laboratory research are designed to meet specific needs of graduate minors in pharmacognosy and satisfy professional elective requirements for pharmacy students. May be repeated for a total of six hours. Prereq: permission of instructor. *Digenis.*

476 *Independent Problems in Pharmacology.* (1-3)
Selected problems requiring literature and laboratory research are designed to meet specific needs of graduate minors in pharmacology and satisfy professional elective requirements for pharmacy students. May be repeated for a total of six hours. Prereq: permission of instructor. *Diamond.*

620 *Biotoxicology.* (3 or 5)
An advanced course in toxicology and toxicodynamics concerned with the sources, isolation, purification identification as well as the physiologic effects on man, animals, and plants of the various toxic substances encountered in the occupations, home, as well as rural and urban environments. Special attention will be given to type compounds as well as structure-activity relationships. Lecture, three hours; lab, four hours. Prereq: BCH 514, 515, CHE 532, PHA 521, and PGY 503 or MM 334 and 346; or consent of instructor.

630 *Biotoxicology.* (3 or 5)
A continuation of MM 620. Prereq: MM 620 or permission of the instructor.

640 *Environmental Toxicology and Occupational Hygiene.* (3)
An advanced course concerned with the recognition, analysis, evaluation, and control of the physical, physiologic, and toxicologic factors arising from occupational and natural environments; their effects on the well-being of the worker and the community; and current practices in their recognition, elimination and/or mitigation. The occupational environment will be considered as a special case of the ambient environment. Special attention will be given to the development of design data for practical problems. Lecture, three hours per week. Prereq: MM 620, 630 or permission of the instructor.

VIII. ALLIED HEALTH PROFESSIONS

CLINICAL NUTRITION

The Master of Science in Clinical Nutrition Degree Program provides an opportunity for graduate study in the fundamentals of Clinical Nutrition. The curriculum is designed specifically to provide practical experience in nutrition in the treatment of illness and the maintenance of health and to deepen the student's foundation in the sciences fundamental to nutrition. It is intended primarily for those who wish to undertake careers in dietetics and clinical nutrition in university hospitals, large community hospitals, and medical centers, for those who intend to teach in the field of clinical dietetics and those who plan careers as members of a research team in clinical nutrition and metabolism.

A minimum of 30 credit hours will be required to complete the degree. No language is required.

REQUIRED COURSES — 10 credit hours

502 *Principles of Human Physiology.* (5)

A basic course in human physiology. Including the functions and regulations of the major body systems. (Same as PGY 810.) Prereq: One yr. in organic chemistry; one sem. of college anatomy, or one yr. of college biology.

CM 601 *Principles of Nutrition in Population Groups.* (2)

Epidemiological aspects of nutrition. Factors affecting adequacy of dietary intake and assessment of nutritional status in population groups. Community programs in social welfare and public health, including city, state, federal and international programs. Field work, 4 weeks. Course will be taught through lectures and discussions. Prereq: BCH 501; BSC 421 (Statistics), PGY 502, 503; SOC 780. Consent of instructor.

601 *Clinical Nutrition.* (4) II

An analysis of the process by which man ingests, assimulates, and utilizes all of the constituents of food in health and disease. Relationship of biochemical and physiological factors to the nutrient requirements of the human body. Evaluation of dietary status and nationale of dietary management. Course to be taught by lectures, clinical rounds, conferences, and written and oral studies. Prereq: PGY 502, 503, consent of instructor. Concur: BCH 501. *Thornton and Staff.*

602 *Current Trends in Nutrition.* (1) I

A seminar to review the current literature of nutrition; development of the techniques for the editing, editorial styles, evaluation and graphic interpretation discussed. Course to be taught through seminar sessions, along with reports and some lectures. Prereq: PGY 502, 503; SC 421. Concur: BCH 501. *Beagle.*

701 *Advanced Clinical Nutrition.* (2) II

A course dealing primarily with the clinical application of the principles of nutrition; to include clinical conferences and case studies. Prereq: CNU 601 or concurrent. *Beagle.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)

May be repeated to a maximum of six credits equivalence. *Staff.*

780 *Independent Study.* (1) I
Required each semester and summer school by all students enrolled in the Clinical Nutrition program. Topics of interest will be reviewed in depth with appropriate presentation. *Robinson.*

781 *Independent Study.* (1) II
Required each semester and summer school by all students enrolled in the Clinical Nutrition program. Topics of interest will be reviewed in depth with appropriate presentation. *Robinson.*

782 *Independent Study.* (1) S
Required each semester and summer school by all students enrolled in the Clinical Nutrition Program. Topics of interest will be reviewed in depth with appropriate presentation. *Robinson.*

COURSES IN COLLEGE OF MEDICINE

BCH 501 *Biochemistry for Dental Students.* (6) I

PGY 503 *Principles of Physiology.* (5)

600 or 700 *Elective.* (3-4)
To be selected from University Graduate School in the Department of Psychology, Sociology, Education, or Microbiology (610).

BSC 772 *Topical Seminar in Medical Behavioral Science.* (1-3) II

SUGGESTED COURSES TO COMPLETE THE 30 HOURS CREDIT

(In consultation with the program director or adviser the student will select certain of the courses listed with the approval of the director).

*BCH 501 *Biochemistry for Dental Students.* (6)

*CNU 502 *Principles of Human Physiology.* (5)
(Same as PGY 810.)

*CH 521 *Community Health.* (3)

*BSC 772 *Topical Seminar in Medical Behavioral Science.* (1-3)

MB 610 *Bacteriology of Foods.* (4)

SOC 532 *Intergroup Relations.* (3)

EDC 607 *Programmed Instruction in the Classroom.* (3)

EDF 661 *Educational Sociology.* (3)
(Same as SOC 661.)

EDP 548 *Educational Psychology.* (3)

Elective.

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* If comparable courses have not been taken prior to entrance into the program, these courses will be considered requirements, in addition, to those listed as required.

COMMUNITY HEALTH

Graduate programs for the degree Master of Science in Public Health are undergoing complete revision at this time. It is anticipated that a new program will be offered in 1972.

500 *Public Health Sanitation.* (3)
A consideration of the cause, prevalence, transmission, and control of preventable diseases. *Hamilton.*

501 *Public Health.* (3) II, S
A continuation of 500; administrative and organizational approach to disease prevention. *Heinz.*

510 *Health Education.* (3) II, S
A course dealing primarily with principles of health education, health service, and health protection. *Heinz.*

511 *Independent Work in Hygiene and Public Health.* (3) I, II, S
Prereq: Major and a standing of 3.0 in the department. May be repeated for a total of 12 credits. *Staff.*

515 *Communicable Diseases.* (3)
Environmental sanitation and the effects of environment on the control of communicable diseases. Prereq: MB 200 or 400 or equiv. *Hamilton.*

520 *Mental Hygiene.* (3) I, II, S
An introduction to mental hygiene including a consideration of the cause, treatment and prevention of mental disorders. Not open to students who have credit in PSY 520. *Staff.*

521 *Community Health.* (3) I, II
An ecological view of community health, a study of the demographic, social, cultural and physical environmental factors that influence a community's state of health. Basic epidemiology and biostatistics are introduced as necessary instruments of community health analysis. Three class hours per week. Prereq: Upper division of graduate standing and consent of instructor. *Eichenberger and Staff.*

522 *School and Community Health.* (2) I, S
A course designed to develop an idea of the cooperative nature of school health work and the importance of connecting it up with adult health work. *Heinz.*

550, 552 *Problems in Health Education.* (2 ea.) I, S
An individual problems course for students and teachers in service, based upon a systematic attack upon the health problems of a school. *Staff.*

600 *Epidemiology.* (3) I, II, S
A study of the natural history of disease. *Hamilton.*

603 *Public Health Records.* (2) I, II, S
General principles of recording, filing, and use of public health data. *Heinz.*

604 *Maternal and Child Health.* (2) I, S
A study of the principles of maternal, prenatal, infant, and child care. *Staff.*

612 *Public Health Administration.* (3) I, S
A consideration of the principles of public health administration. *Heinz.*

613 *Public Health Administration.* (2) II, S
A continuation of 612. *Heinz.*

618 *Vital Statistics.* (3) I, S
Application of the statistics of population, births, deaths, etc. in Public Health. *Staff.*

619 *Vital Statistics.* (2) II, S
A continuation of 618. *Staff.*

625 *County Health Practice for Health Officers.* (3) I, II, S
An internship in actual county health practice. *Staff.*

626 *County Health Practice for Health Officers.* (2) I, II, S
A critical analysis of one service of the Fayette County Health Department. *Staff.*

768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

770 *Seminar* (1) I, II, S
Staff.

RADIATION MEDICINE

Two programs in the Bioradiation Sciences are available leading to the degrees, Master of Science in Radiological Health and Master of Science in Medical Radiation Dosimetry.

Graduates of accredited colleges with an appropriate baccalaureate (for example, Biological Sciences, Physics, Public Health, Mathematics, Chemistry, etc.) may become candidates for one of these degrees. Physics 260 or its equivalent is a prerequisite for both programs and Computer Science 220 or its equivalent is also a prerequisite for the program in Medical Radiation Dosimetry.

Both programs are an interdisciplinary type. As such, Plan B is utilized for the graduate work, incorporating specific courses in several departments. There is no language requirement. A core of courses is common to both programs. Additional and special course work is prescribed for each program as degree requirements.

THE CORE PROGRAM

ZOO 540	*General Radiation Biology.*	(4)
ZOO 640	*Biological Effects of Radiation.*	(3)
PHY 472	*Interaction of Radiation with Matter.*	(3)
PHY 535	*Experimental Physics, Atomic and Nuclear.*	(2)
RT 545	*Radiation Hazards and Protection.*	(2)
RM 710	*Seminar in Bioradiation Sciences.*	(1)
STA 670	*Basic Statistical Analysis.*	(4)
		19

Master of Science in Radiological Health Specialty

ADDITIONAL PROGRAM

CH 600	*Epidemiology.*	(3)
CH 612	*Public Health Administration.*	(3)
RM 720	*Advanced Problems in Radiological Health.*	(2-4)
Area Electives.		(5-7)
		13

Special Instruction in Radiological Health will run concurrently with the last semester of the Program. It will be under the staff of the Radiology Department. (0)

Total 32 minimum

Master of Science in Medical Radiation Dosimetry

ADDITIONAL PROGRAM

ANA 511	*Introduction to Anatomy.*	(4)
PGY 502	*Principles of Physiology Lectures.*	(3)
RM 715	*Advanced Problems in Radiation Dosimetry.*	(2-6)
Area Electives.		(2-5)
		12

Special instruction in Medical Radiation Dosimetry will continue for six months following completion of formal course work. This instruction will be under the staff of the Radiology Department. (0)

Total 31 minimum

690 *Research in Radiological Health.* (1-3) I, II

Research in the area of radiological health. Prereq: Graduate standing in the Bioradiation Sciences. *Sayeg.*

695 *Research in Radiation Dosimetry.* (1-3) I, II

Independent directed research on theoretical and practical problems in the measurement of radiation. Prereq: Graduate standing in one of the Bioradiation Sciences. *Sayeg.*

710 *Seminar in Bioradiation Sciences.* (1) II

Topics of current interest relating to radiation and its biomedical significance will be discussed. Prereq: Graduate standing in a radiation-related science. *Calkins.*

715 *Advanced Problems in Radiation Dosimetry.* (2-6) I, II

To be taken concurrently with supervised individual study. Problems in radiation measurement, distribution of energy, computation of dose, and biological and medical effects of an advanced nature will be analyzed, discussed, and described in written reports. Problems will require literature search and utilization of advanced analytical techniques. Prereq: Completion of formal course work in the Medical Radiation Dosimetry program or consent of instructor. *Greenlaw, Sayeg.*

720 *Advanced Problems in Radiological Health.* (2-4) I, II

Advanced problems in radiological health and related areas in physics, biology or medicine will be analyzed. Prereq: Completion of formal course work in Radiological Health Specialty program or consent of instructor. *Sayeg.*

IX. HOME ECONOMICS

Requirements for the Degree of Master of Science in Home Economics (See also pages 15-24).

Students who are graduates of fully accredited institutions of higher learning may obtain the degree of Master of Science in Home Economics by satisfying the following requirements.

1. The completion of 24 semester hours of graduate work with an average standing of 3.0 or better, and a thesis, or at the option of the major professor, the completion of 36 semester hours of graduate work with a standing of 3.0 or better, and no thesis requirement. At least one-half of the hours must be on the 600 level or above.
2. Under either plan no grade below C may be counted.
3. One-half of the work must be in one section or department, the remainder in any other department or departments approved by the major professor.
4. There is no language requirement for this professional degree.

A final oral examination is given the candidate not later than 8 days before the close of the semester in which the degree is to be secured. The candidate is expected to show a comprehensive knowledge of the subject matter related to the field of his major work and in case a thesis has been prepared to defend it.

The program of graduate study developed for each graduate student is based on his career objectives and previous academic background. Those without sufficient background or training will be expected to make up deficiencies indicated by the section or department. Except for courses in research methods and statistics, students selecting Family Life, Management and Family Economics, or Textiles and Design as an area of specialization are required to select one of the departments in the social and economic sciences for work to fulfill degree requirements.

HUMAN DEVELOPMENT AND FAMILY RELATIONS

552 *Nursery School Organization.* (3) I, S

Organization and administration, including housing, equipment, program, records, parent cooperation. Field trips to nursery schools. Lecture, three hours. Prereq: HE 350.

553 *The Child in His Family.* (3) II, S

Preparation and presentation of research reports of studies of family influences on the personality and development of children. Lecture, three hours. Prereq: HE 153, and six credits in SOC and/or PSY.

555 *Creative Experiences and Concept Development: Pre-school Years.* (3) I, II

Techniques, methods and materials necessary for creative experiences in play, music, graphic and plastic arts, literature, language, and science, and concept development in time, space and numbers for the preschool child. Lecture, two hours; lab, two hours. Prereq: HE 350 or consent of instructor.

557 *Infant Development.* (2) S

Study of development, care and guidance of the child during prenatal, natal and infant periods. Lecture, two hours. Prereq: PGY 206.

558 *Adolescence.* (3) I, II

The psychosexual development of the adolescent in relation to family, peers, and the adult world. Three class hours per week; laboratory, one hour. Prereq: HE 153, and HE 254 or SOC 510.

595 *Special Problems in Child Development and Family Relationships.* (1-3) I, II, S

Intensive work on specific problems. May be repeated for a total of six credits. Prereq: Consent of instructor.

775 *Seminar in Child Development.* (2-6) I, II, S

Preparation and presentation of reports of current investigations in child development. Prereq: graduate standing.

785 *Special Problems in Child Development and Family Living.* (1-3) I, II, S

Independent advanced work. May be repeated for a total of six credits.

MANAGEMENT AND FAMILY ECONOMICS

462 *Personal and Family Finance.* (3) I, II

A study of individual and family financing as related to planning the use of credit, savings, investments, insurance, taxes, home ownership and estates. Prereq: ECO 260.

463 *Home Management and Family Relationships.* (3-4) I, II, S

A residence period in the Home Management House is required of seniors in home economics. Experience in the application of principles presented in other courses. Prereq: HE 361 and NFS 206.

596 *Special Problems in Home Management.* (1-3) I, II

Intensive work on specific phases or home management. Prereq: consent of instructor. May be repeated for a total of six credits.

662 *Advanced Home Management and Family Relationships.* (3) II, S

A course affording opportunity for special study of social and economic problems affecting family life. Lecture, three hours. Prereq: HE 463. *Wilmore.*

786 *Special Problems in Home Management.* (1-3) I, II

Independent advanced work. May be repeated for a total of six credits. *Wilmore.*

TEXTILES, CLOTHING AND MERCHANDISING

420 *Tailoring.* (3) I, S

Analysis of tailoring techniques in the shop and in the home. Tailored garments are planned and constructed. Lecture, one hour; lab, four hours. Prereq: HE 227 or consent of instructor.

422 *Economics of Clothing.* (3) I, S
The clothing industry, its influence and economy. Field trips, class projects, and individual semester reports. Projects involve merchandising display and fashion show. Lecture, two hours; lab, two hours. Prereq: Consent of instructor.

520 *Textiles II.* (3) I, S
Consideration of recent textile developments with emphasis on man-made fibers, new construction techniques and finishes. Opportunity for individual investigation. Lecture, one hour; lab, four hours. Prereq: HE 120, CHE 104, or CHE 112.

523 *Socio-Psychological and Economic Aspects of Apparel.* (3) II, S
A study of the social, cultural, psychological and economic factors which influence apparel and apparel use with particular emphasis on present day apparel in America. Lecture, 3 hours. Prereq: SOC 101 or ANT 121 and ECO 260.

524 *History of Costume.* (3) I, S
Development of costume from ancient to modern times with consideration of historic, social, and economic setting. Lecture, two hours; lab, two hours. Prereq: A-S 180, HE 120, 227 or consent of instructor.

529 *The Child and His Clothing.* (3) S
A detailed study of the selection, cost and care of the pre-school child's clothing in relation to his needs. Lectures and occasional field trips. Prereq: HE 255. *Staff.*

532 *Retail Job Analysis.* (5) I
Supervised experience in apparel merchandising procedures through a cooperative program with a retail establishment. (One half semester of eight hours a day per week.) Prereq: HE 523, 422, BA 330.

534 *Decorative Textiles.* (2) II, S
Survey of techniques used in applying color and design to fabrics. Individual problems, demonstrating techniques, developed. Lecture, one hour; lab, two hours. Prereq: HE 120.

592 *Special Problems in Clothing and Costume Design.* (1-3) I, II, S
Intensive work on specific phases of the field. Senior or graduate standing. May be repeated for a total of six credits. Prereq: Consent of instructor.

597 *Special Problems in Textiles.* (1-3) I, II, S
Intensive work on specific phases of the field. Senior or graduate standing. May be repeated for a total of six credits. Prereq: Consent of instructor.

772 *Seminar in Textiles, Clothing, Costume Design, and Interior Design.* (2) S
Investigation of special textile, clothing, and costume design or interior design problems; lecture, two hours. May be repeated twice for a total of six credits. *Staff.*

782 *Special Problems in Clothing and Costume Design.* (1-3) I, II, S
Independent advanced work on a specific problem. May be repeated for a total of six credits. *Staff.*

787 *Special Problems in Textiles.* (1-3) I, II, S
Independent advanced work on a specific problem. May be repeated for a total of six credits. Concur: HE 528.

NUTRITION AND FOOD SCIENCE

Work leading to the master's degree must conform to general rules and regulations of the Graduate School and the School of Home Economics.

Bachelor of Science degree with a major in Foods, Nutrition, Life Science

nd/or Home Economics option with a background in biological and physical ciences will be required for admission. Those without sufficient background r training will be required to make up deficiencies indicated by the department. Emphases in Science, Education or Institutional Management are possible.

Programs are designed for individual interest and needs. The non-thesis ption provides nutrition education emphasis useful to majors in public health utrition, vocational education, dietitians, college teachers and extension special-sts. Requirements for the Master of Science degree in Home Economics are: ompletion of 24 semester hours of graduate courses and a thesis or, at the ption of the major professor and student, the completion of 36 semester hours f graduate work without a thesis.

Inquiries concerning the details of graduate programs (including work eyond the master's) as well as possible financial support of graduate students hould be addressed to the Chairman of the Department of Nutrition and Food cience.

503 *Community Nutrition.* (3) I, II, S

tudy of nutrition education programs on a community level. Experience is provided for resenting nutrition in health clinics, schools, and state institutions. Lecture, 2 hours; lab, hours. Prereq: or concurrent; NFS 302. May be repeated for a total of six credits. *Staff.*

505 *Experimental Foods.* (3) II, S

tudy of factors that affect results obtained in cooking and food preparation processes. xperimental work under controlled conditions. Lecture, one hour; lab, four hours. Prereq: NFS 204, 311. *Brownlie.*

507 *Workshop in Applied Nutrition.* (2)

The application of scientific knowledge of nutrition to the promotion of positive health. Emphasis is given to communications techniques and their use in field work. *Staff.*

508 *Seminar in Nutrition.* (1) I, II, S

nvestigations of recent research in nutrition. Prereq: Senior or graduate standing. May be epeated twice for a total of three credits.

512 *Normal and Therapeutic Nutrition.* (5) I, II

pplication of elementary biochemistry to understanding the utilization and function of utrients in the body. Correlating metabolic changes due to disease with diet therapy. ecture, four hours; lab, two hours. Prereq: NFS 311, CHE 236. *Chen and Packett.*

514 *Food Preservation.* (3) I, S

rinciples of home food preservation. Canning, dehydration, and freezing of fruits, vegetables nd meats; pickling of fruits and vegetables; making of jams, jellies and preserves; brining. ecture, two hours; lab, two hours. Prereq: MB 200, NFS 204.

516 *Food for Children.* (3) II, S

xperience in selection, preparation and serving of food to young children. Emphasis is laced on the pre-school age and the factors important to establishing good food habits. rereq: NFS 206, 311, HE 255. *Staff.*

517 *Food for Special Occasions.* (3) I, S

dvanced work in culinary arts and skills. Preparation of attractive and appetizing dishes o help the homemaker in planning buffet suppers, receptions, picnics, wedding parties, ormal meals. Lab, six hours. Prereq: NFS 204, 206. *Taylor.*

540 *The School Lunch.* (3) I, II

Designed for teachers who manage the lunch room. Consideration is given to equipment, enus, purchase, storage, preparation and service of food. Lecture, two hours; lab, two ours. Prereq: NFS 204, ECO 260. *Brownlie.*

542 *Institution Equipment.* (3) I
Selection, arrangement, cost and care of equipment; problems of lighting, heating, ventilation and refrigeration. Two field trips are taken to neighboring cities to see equipment in use in institutions. Prereq: NFS 342. *Brownlie.*

546 *Institution Organization and Management.* (3) II
Principles of institution organization, types of institution service, personnel and financial management. Legal aspects of institution management. Personal and professional qualifications of an institution manager. Prereq: NFS 340, 342. *Brownlie.*

548 *Institution Administration.* (3) S
Application of scientific principles are developed in various aspects of food service management. Approval of instructor. May be repeated twice for a total of nine credits. *Brownlie.*

590 *Field Work in Nutrition.* (1) I, II, S
Nutrition problems at different age levels, correlated with surveys and experimental studies to show the relation between diet selection and its physical and mental effects. Lecture and laboratory. May be repeated 3 times for a maximum of 4 credits. Prereq: NFS 503, or approval of instructor.

591 *Special Problems in Foods and Nutrition.* (1-3) I, II, S
Intensive work on a specific phase of the field. Senior or graduate standing. May be repeated for a maximum of six credits. Prereq: Consent of instructor.

594 *Special Problems in Institution Management.* (1-3) I, II, S
Intensive work on specific problems. Prereq: Consent of instructor. May be repeated for a total of six credits. *Staff.*

603 *Advanced Community Nutrition.* (3) I, II, S
Study of nutrition surveys and of bases for judging community nutrition. Emphasis is placed upon economic, geographic, social and educational causes of malnutrition. Experience is given in development of nutrition programs. Prereq: NFS 503. May be repeated once for a total of six credits. *Marlatt.*

610 *Human Nutrition I.* (4) I, II
The application of biochemical analytical and preparative analysis of blood, urine and tissues to the analysis of nutrient metabolism and human health status. Lecture, two hours; lab, six hours. Prereq: NFS 311, CHE 236, NFS 512. *Packett and Chen.*

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence.

771 *Seminar in Nutrition.* (2) II, S
May be repeated twice for a total of six hours. *Staff.*

781 *Special Problems in Foods and Nutrition.* (1-3) I, II, S
Independent advanced work on a specific problem. May be repeated for a total of six credits.

784 *Special Problems in Institution Management.* (1-3) I, II, S
Independent advanced work. May be repeated for a total of six credits. *Brownlie.*

HOUSING AND INTERIOR DESIGN

520 *Textiles II.* (3) I, S
Consideration of recent textile development with emphasis on man-made fibers, new construction techniques and finishes. Opportunity for individual investigation. Lecture, one hour; lab, four hours. Prereq: HE 120, CHE 104, or CHE 112.

330 *Advanced Interior Design.* (2)
The art of interior decoration throughout the past and today. Interiors are planned to meet today's needs. Lecture, one hour; laboratory, two hours. Prereq: HE 330.

332 *Retail Job Analysis.* (5) I
Supervised experience in apparel merchandising procedures through a cooperative program with a retail establishment. (One half semester of eight hours a day per week.) Prereq: HE 422, 523, BA 330.

334 *Decorative Textiles.* (2) II, S
Survey of techniques used in applying color and design to fabrics. Individual problems; demonstrating techniques developed. Lecture, one hour; lab, two hours. Prereq: HE 120.

336 *Interior Decoration Projects.* (2) I, II, S
Selected projects in furnishing the home, including furniture refinishing, upholstering and slip cover making. Costs in terms of time and money are considered. Lab, four hours. Prereq: HE 330, or approval of instructor. *Bennett.*

337 *History of Furniture.* (4) II
Study of historic styles of furnishings, textiles, and decorative accessories through contemporary design. Supplementary information through slides and field trips. Application of information through research project on selected topics. Lecture, 4 hours. Prereq: HIS 104, 105.

338 *Materials and Methods in Interiors.* (3) I
Emphasis on lighting, built-in equipment, measurement, and cost specifications. Individual study of specific problems encountered in home design. One class hour per week; lecture and lab four hours per week. Prereq: HE 332.

393 *Special Problems in Housing and Interior Design.* (1-3) I, II, S
Intensive work on specific phases of the field. Senior or graduate standing. May be repeated for a total of six credits. Prereq: Consent of instructor.

397 *Special Problems in Textiles.* (1-3) I, II, S
Intensive work on specific phases of the field. Senior or graduate standing. May be repeated for a total of six credits. Prereq: Consent of instructor.

472 *Seminar in Textiles, Clothing, Costume Design, and Interior Design.* (2) S
Investigation of special textile, clothing, and costume design or interior design problems; lecture, two hours. May be repeated twice for a total of six credits. *Staff.*

483 *Special Problems in Interior Design.* (1-3) I, II, S
Independent advanced work on a specific problem. May be repeated for a total of six credits. Staff.

487 *Special Problems in Textiles.* (1-3) I, II, S
Independent advanced work on a specific problem. May be repeated for a total of six credits. Concur: HE 528.

GENERAL COURSES

575 *Community Analysis.* (3)
A study of communal structure and processes with special emphasis on strategies of field investigation of particular communities. Prereq: SOC 101 or equivalent or consent of instructor. (Same as SOC 413.)

588 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated once.

X. LIBRARY SCIENCE

The School of Library Science offers the master's degree according to Plan A and the professional degree of Master of Science in Library Science according to Plan B. The specific library science requirements are as follows:

1. A bachelor's degree from an accredited institution. No special major or minor fields are required.
2. The language requirement for the M.S.L.S. can be fulfilled by the completion of two full years of college study with at least a grade of C in French, German or Russian, by passing a language examination, or by successful completion of one of the special language courses for graduate students (French 011 or German 21).
3. Six hours of prerequisite work in library science from among LS 500, LS 501, LS 502 or LS 503 or their equivalents. Courses taken more than eight years before admission into the graduate library science program may not be counted as prerequisites. These prerequisite hours may be taken concurrently with graduate course work.
4. Thirty semester hours in graduate courses (fifteen of these in courses numbered 600 or above) for the M.S.L.S. under Plan B or 24 credit hours plus a thesis under Plan A.
5. The completion of the following specific courses: LS 500, 501, 502, 503, 608, 613 and one from each of the following two groups: LS 602, 603 or 604; LS 609, 610, 611 or 612.

Prospective students should also obtain a copy of the catalog which is published yearly by the School of Library Science for additional information.

500 *Library Administration.* (3) I, II, S

Developing knowledge and skills of library management with emphasis upon organization, library relationships, personnel, quarters and equipment, budgets and reports. Growth of librarianship as a profession and important literature of the field. Provision will be made for individual study in each person's area so that principles will be applied to practice. Three class hours per week. *Staff.*

501 *Organization of Library Materials I.* (3) I, II, S

Principles, concepts, methods and problems in organizing library collections for effective use. Study of the fundamental principles and methods of classification and cataloging of books and non-book materials, bibliographical description and subject analysis. *Evans.*

502 *Reference and Information Services.* (3) I, II, S

An introduction to reference materials, their content, evaluation, organization and use. Emphasis will be placed upon essential works, including dictionaries, encyclopedias, atlases, directories, year-books, periodicals, indexes and other guides to basic reference materials. *Larsen.*

503 *Development of Library Collections.* (3) I, II, S

Selection and acquisition of library materials, analysis and evaluation of book selection aids in the several communication media. Emphasis will be placed on the structure of the book-trade, methods and criteria of selection, the organization of acquisitions work, and use of major national and trade bibliographies of the world. Three class hours per week. *Cazden.*

510 *Children's Literature and Related Materials.* (3) I, II, S

A survey of children's literature, traditional and modern. Reading and evaluation of books with emphasis on the relationship of the materials to the needs and interests of children. Covers various types of materials for use by and with children of grades 1-6. *Pillon, Binger, Gallagher, M. Bobinski.*

511 *Literature and Related Materials for Young People.* (3) I, II, S

Covers types of materials for use by and with readers of grades 7-12. Emphasis upon materials for curricular and recreational reading. Attention is given to some types of adult materials suitable for more mature students. Practice in the use of standard book selection aids. *Pillon, Martin.*

512 *School Library Practice.* (3) I, II, S

Observation and supervised work in a school library, fulfilling a state requirement for certification. Applications for placement must be submitted early in the semester preceding which placement is desired. Prereq: LS 500 501, 502, 510, 511. *Pillon.*

586 *Utilization of Educational Media.* (3)

Surveys the broad area of educational media with an emphasis on utilization and the advantages and disadvantages of the various media. Provides experience in relating educational technology to productive learning activity. (Same as EDC 544.)

600 *Advanced Library Administration.* (3) I

The library as a social system with emphasis upon organization, communications, leadership and an application of behavioral management theories to the library. Three class hours per week. Prereq: LS 500. *Allen.*

601 *Organization of Library Materials II.* (3) II, S

Advanced studies in organization of library materials, including special materials such as pamphlets, clippings, pictures, slides, films, phonorecords, music, maps, manuscripts, archival records and rare books. Prereq: LS 501 or equiv. *Evans.*

602 *Bibliography of Social Sciences.* (3) II, S

Survey and evaluation of library materials in the social sciences with emphasis on reference and bibliographical sources in the following areas: Anthropology, Business, Economics, Education, Geography, History, Law, Political Science, Psychology, Sociology, and other closely related subjects. Prereq: LS 502 or equiv. *G. Bobinski.*

603 *Bibliography of the Humanities.* (3) I, S

Survey and evaluation of library materials in the humanities, with emphasis on reference and bibliographical sources in the following areas: the Arts, Language, Literature, Music, Philosophy, Religion and other closely related subjects. Three class hours per week. Prereq: LS 502. *Cazden.*

604 *Bibliography of the Sciences.* (3) II, S

A survey and evaluation of library materials in the sciences with emphasis on reference and bibliographical sources in the following areas: Agriculture, Astronomy, Biology, Chemistry, Mathematics, Natural Resources, Zoology, and other closely related materials. Three class hours per week. Prereq: LS 502. *Sanderlin.*

605 *Library Systems Analysis.* (3) I, II, S

Role of systems analysis in libraries with emphasis on the analysis, design and implementation of library systems. The application of tools and techniques used in systems analysis, such as flow charting, data gathering techniques. An introduction to electronic data processing and statistical evaluation methods. Prereq: LS 500. *Sanderlin.*

606 *Automation and the Library.* (3) II, S

Introduction to the practice and literature of automation and its implication and application to libraries. A survey and evaluation of electronic and other automated systems for the storage and retrieval of information. Emphasis on understanding the principles and concepts of automation and computers for libraries. Three class hours per week. Prereq: LS 605; CS 220. *Sanderlin.*

608 *Methods of Research in Librarianship.* (3) I, II, S
Basic tools, techniques and methods of library research. Consideration to the role and purpose of research in librarianship and relationship to research in other fields. Critical evaluation of current research reports in library literature and the development of a research proposal. *Allen.*

609 *Public Libraries.* (3) II, S
An analysis of public library work with emphasis on problems in history and development, administrative and management and current trends. Some attention given to county and regional development. *Frey.*

610 *Academic Libraries.* (3) II, S
History, aims and functions of university and college libraries including organization, collection building and evaluation, finance and personnel. Recent trends in national and regional cooperation. Undergraduate libraries, community colleges and the "library college" will also be reviewed. *Forth.*

611 *Special Libraries.* (3) II, S
Organization, administration and services of the library serving a selective clientele with consideration of the role of the library as a part of the larger institution with well-defined functions. Three class hours per week. Prereq: LS 500.

612 *Instructional Materials Centers.* (3) II, S
Leadership responsibility of the librarian in an age of changing media of communication, the philosophy of the modern school and the librarian's role in implementing it, acquiring, organizing and assisting faculty in learning to use all available media. Relation of the individual school to the district materials center, type of personnel, equipment and collections needed in each. Three class hours per week. *Pillon.*

613 *Introduction to Information Sciences.* (3) I
Introduction to the major aspects of scientific and technical information centers, documentation and the use and users of scientific information. Knowledge of systems analysis would be helpful. Three class hours per week. Prereq: CS 220 or equivalent. (Same as CMO 613.) *Sanderlin.*

614 *Information Storage and Retrieval Systems.* (3) II
Review of the various solutions for storing and retrieving information, ranging from traditional records and devices to modern computers. Emphasis upon modern electronic equipment for information handling. Three class hours per week. Prereq: LS 613. (Same as CMO 614.) *Sanderlin.*

615 *Information Systems Design.* (3) I, S
Principles and problems of information systems: systems analysis applied to information systems. Design of information systems with particular attention to equipment, training of personnel, and evaluation. Three class hours per week. Prereq: LS 614. (Same as CMO 615.) *Sanderlin.*

617 *History of Books and Printing.* (3) I, II
The making of books from earliest times to the present, including the manuscript book, the invention and spread of printing, type design, methods and styles of illustration. Technological and political aspects will also be emphasized. *Cazden, Hammer.*

618 *Books for Adults.* (3) II, S
Selection, use and individual evaluation of books for the typical community library. Distinctions between the notable, the popular and the significant in books which meet the needs of adult library patrons. Prereq: LS 503 or equivalent. *G. Bobinski.*

619 *Adult Services.* (3) II, S
Emphasis on the library as an educational institution, influence of educational and sociological trends, with examination of reading and library surveys, practice in the utilization of adult education techniques. Determination of realistic goals for library participation in community action programs, services to groups such as labor unions, professional and business groups, the aged, culturally disadvantaged, etc. Prereq: LS 609. *Bobinski.*

520 *Rare Books Bibliography.* (3) II
(Alternate summers)
Introduction to descriptive bibliography and to a wide range of bibliographical reference works necessary for a modern special collections or rare book librarian. Topics include incunabula research, paper and watermarks, the canons of description, and recent trends in institutional collections. Prereq: LS 617. *Cazden.*

521 *Special Collections.* (3) II
The acquiring, processing and servicing of rare books, manuscripts and other special materials. Attention is given to the criteria for building a collection and for its interpretation through descriptive guides and catalogs, and to the relation of the special collection department to the research worker and the library as a whole. Three class hours per week. *Bull.*

523 *Subject Bibliography.* (3) S
Survey and evaluation of library materials in a special subject area, with emphasis on reference and bibliographical sources. Subject areas vary, e.g., theology, law, medicine, engineering, and other topics. Three class hours per week. (May be repeated for credit when topics vary to maximum of 9 hours.) Prereq: LS 502.

524 *Library of Congress Classification.* (3) S
Theory, development and practice of classification in libraries with a strong emphasis on Library of Congress Classification. Colon, Cutter Expansion, Dewey Decimal, Universal Decimal, and other classification schemes will be studied for comparative purposes. Three class hours per week. Prereq: LS 501. *Evans.*

525 *Publishing and the Booktrade.* (3) II
History of publishing and bookselling: the structure of the booktrade today. International in scope with special attention given the antiquarian and reprint trade. Three class hours per week. Prereq: LS 501. *Cazden.*

526 *Government Publications.* (3) II
Study of the nature and scope of government documents, including problems and methods of acquisition, organization, and reference use of federal, state, local and international publications. Prereq: LS 502 or equivalent. *Willis.*

527 *History of Libraries.* (3) II
Development of libraries from earliest times to the present with special reference to the relationship of the library to the contemporary social, economic, cultural and political trends. Three class hours per week. *G. Bobinski.*

528 *Library Buildings.* (alternate years) (3) I, S
Relationship between physical structure and library function; problems in planning and building procedures, library equipment, acoustics, illumination, and materials of construction. Three class hours per week. Prereq: LS 500.

529 *Public Library Systems.* (3) S
Survey of the changing nature of public library government, larger units of service financed by federal and state assistance, influence on the role of the small public library in new methods of evaluation and stimulation of long range planning. Three class hours per week.

539 *Organization and Administration of Youth Services in Public Libraries.* (3)
(Alternate years and summers)
Study of the historical development and changes in patterns of library service to young adults. Definition of the respective roles of the school and public library, cooperation with other community agencies, critical evaluation of current procedures. Three class hours per week. Prereq: LS 511 and LS 609. *Pillon.*

587 *Non-Book Materials.* (3)
The function, evaluation, selection, acquisition, preparation for use, and preservation of non-book materials in the library program. Prereq: LS 501, 502 or equivalents.

700 *Seminar: Library Organization and Management.* (3)
(Alternate years and summers)
Major problems and newer developments in the field of management and administration and casting them in the library environment. Current research in library management. For the advanced student. Three class hours per week. Prereq: LS 500 and 600 or equivalent. *Allen.*

701 *Seminar: Library Materials and Services for Children and Young People.* (3) II
Intensive study of special problems in the development of collections for young people, controversial aspects of book selection, studies of reading interests, relation of types of libraries: school, public, extension through bookmobile, and institutional services, regional and state plans. Three class hours per week. Prereq: LS 504, 505. *Pillon.*

702 *Seminar in Printing and Publishing History.* (3)
(Alternate years and summers)
Bibliographical and technical background for original research in various fields of bookmaking, printing, publishing and the dissemination of literature. Survey of current trends in research. For the advanced student. Three class hours per week. Prereq: LS 617 and 625. *Cazden.*

703 *Seminar: Technical Services.* (3)
(Alternate years and summers)
Survey and analysis of technical services in libraries, with special attention to both historical and recent developments, controversial issues, current trends, and literature of the field. Three class hours per week. Prereq: LS 501, 503 and 601 or permission of instructor. *Evans.*

704 *Seminar: Education for Librarianship.* (3)
(Alternate years and summers)
Attention is given to the development of library education with an emphasis on current trends and problems. Explanation of curriculum development and instructional techniques in library schools. Three class hours per week. *Allen.*

705 *Seminar: Information Sciences.* (3)
(Alternate years and summers)
An investigation of the parameters of information sciences from an interdisciplinary approach. Investigation and analysis of the literature of communications, management science, cybernetics, information theory to identify the similarities and differences. From this investigation, both qualitative and quantitative concepts of the directions of information science will be derived. Three class hours per week. (Same as CMO 705.) *Sanderlin.*

710 *Independent Study in Library Science.* (3) I, II, S
Opportunity for directed study in subject or problems of interest to the student. Observation and research is required, and a written report describing the work accomplished is required. May be repeated to a maximum of 6 hours.

711 *Workshops in Librarianship.* (1-4)
Intensive study in one aspect of liberarianship under the leadership of an authority in that field. Duration is normally shorter than a regular University term, and the student is expected to devote his full time to the course. May be repeated for credit when topics vary.

768 *Residence Credit for the Master's Degree.*
(1 to 6 credits equivalence)
May be repeated to a maximum of six credits equivalence. *Staff.*

XI. DENTISTRY

The program leading to the Master of Science in Dentistry degree is designed to provide the graduate dentist with clinical proficiency in a specialty area, research experience in a basic biological discipline, and exposure to the fundamentals of teaching in the field of dentistry. At the present time, students pursuing specialty training in the area of orthodontics are eligible for the Master of Science in Dentistry.

Only dental graduates of high academic standing will be accepted into this program, which requires two years of clinical training in orthodontics, integrated with additional basic science and research experience. The first year is largely devoted to clinical training, lectures and seminars. The second and later years will be a continuation of clinical orthodontics, with a high proportion of time devoted to basic science studies, research, and dental teaching techniques.

The program is interdisciplinary in scope and is taught by systems rather than the classic strict subject approach. The participating faculty is from all the clinical departments of the College of Dentistry, from the Medical Center departments of anatomy, pediatrics, psychiatry and behavioral science, and from the University Hospital.

Specific requirements for the Master of Sciences in Dentistry degree are: (1) satisfactory completion of the clinical certificate program; (2) 30 hours graduate credit, at least half of which must be basic science (non-clinical) courses; (3) submission of an acceptable thesis based on an individual research project and (4) passage of a comprehensive oral examination. Foreign language credit is not required.

ORT 610 *Cranio-Facial Form.* (3) S

Applied radiographic anatomy for graduate students in dentistry. Three class hours per week. Prereq: Admission to graduate dental program; D.D.S. or D.M.D. degree.

ORT 620 *Oral-Pharyngeal Function.* (Part I) (2)

Basic and applied physiology for graduate students in dentistry. Two and a half class hours per week. Prereq: Admission to a graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

ORT 621 *Oral-Pharyngeal Function.* (Part II) (2) S

A continuation of ORT 620, emphasizing speech physiology and language development. Two and a half class hours per week. Prereq: Admission to a graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

CDS 611 *Child Growth and Development.* (Part I) (2)

A seminar course on nature and physiologic control of physical growth, for graduate students in dentistry. Two class hours per week. Prereq: Admission to a graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

CDS 612 *Child Growth and Development.* (Part II) (1) S

A seminar course for graduate students, in dentistry covering emotional and intellectual growth of children, and diseases and congenital anomalies of children. One and a half class hours per week. Prereq: Admission to graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

CDS 631 *Principles of Dental Occlusion.* (2)
This course is designed to give the student as broad as possible a view of the complex subject of dental occlusion. Two class hours per week. Prereq: Admission to dental graduate program; D.D.S. or D.M.D.

ORT 660 *Orthodontic Seminar-Clinic.* (2)
Seminar, laboratory and clinical instruction in orthodontic theory and practice. One and a half class hours per week; fifteen lab hours per week. Prereq: Admission to graduate programs of College of Dentistry; D.D.S. or D.M.D. degree.

ORT 661 *Orthodontic Seminar-Clinic.* (3) S
Seminar, laboratory and clinical instruction in orthodontic theory and practice. Three class hours per week. Fifteen lab hours per week. Prereq: ORT 660.

ORT 700 *Orthodontic Seminar.* (1)
Seminar in orthodontic theory and practice for advanced graduate and post-doctoral students in orthodontics; may be repeated to a maximum of five credits. Three class hours per week. Prereq: ORT 660, 661.

ORT 750 *Research in Orthodontics.* (1-5)
Research in orthodontics: maximum of five credits. Prereq: Admission to the orthodontic graduate program of the College of Dentistry; Special permission.

ORT 768 *Residence Credit for the Master's Degree.* (1 to 6 credits equivalence)
May be repeated to a maximum of six credits.

ODM 610 *Developments in Oral Medicine.* (2)
A seminar course for graduate students in dentistry, covering medical implications of dental treatment and current research in oral medicine. Two class hours per week. Prereq: Admission to graduate program of the College of Dentistry.

PER 661 *Modern Concepts in Periodontics.* (2) II
A seminar course designed to present the present understanding of the etiology of periodontal disease and current techniques for treatment of periodontal problems. Two class hours per week. Prereq: Admission to graduate programs of College of Dentistry; D.D.S. or D.M.D. degree.

PDO 631 *Dental Care for the Chronically Ill and Handicapped Child.* (2)
A seminar course for graduate students in dentistry dealing with special dental problems of handicapped children. Two class hours per week. Prereq: Admission to dental graduate program; D.D.S. or D.M.D. degree.

CDS 550 *Research Methodology and Instrumentation.* (2)
Seminars and laboratory work involving methods of several modern research fields. One class hour, and 2 lab hours per week. Prereq: D.D.S. or D.M.D. degree; admission to graduate dental program; or special permission of instructor.

CD 655 *Practice Environment and Practice Management.* (1)
A seminar course for graduate and post-doctoral students in dentistry, concerning community needs, attitudes and programs for dental services, particularly those provided by specialists. One and a half class hours per week. Prereq: Admission to graduate programs of College of Dentistry; D.D.S. or D.M.D. degree.

OP 651 *Patho-Physiology of Oral Disease.* (3)
Seminar course in advanced oral pathology. Three class hours per week. Prereq: Dental degree and enrollment in a graduate program of the College of Dentistry; or permission of the instructor.

OS 651 *Anatomical Relationships in Surgery.* (1)
A seminar course for dental graduate students in areas other than surgery, emphasizing anatomical and surgical principles applicable to all dental specialties. One class hour per week. Prereq: Admission to graduate or post-doctoral programs of College of Dentistry; D.D.S. or D.M.D. degree.

XII. NURSING

The College of Nursing offers a master's program in nursing under Plan B. The program is one calendar year in length and requires a minimum of 30 credits. There is no language requirement for this professional degree program.

The general Graduate School admission requirements apply; however, applicants are asked to submit Graduate Record Examination scores at the time of application for admission. The transcripts of all applicants not graduated from NLN accredited baccalaureate programs in nursing will be evaluated individually and additional coursework prescribed for deficiencies. Nurse licensure is required and personal interviews will be arranged when feasible.

Eighteen credits in nursing plus Behavioral Science 772 are required of all students. The remaining credits may be selected from several designated areas with the consent of the adviser. The Master of Science in Nursing degree is awarded upon completion of the program requirements with a grade point average of 3.0 or better.

610 *Concepts and Theories in Nursing.* (6)

Study and analysis of concepts and theories from nursing and cognate areas. The focus is on nursing in any setting, viewed through the spectrum of human needs, health-illness continuum and the age span. Students explore the commonalities of nursing, teaching and administration and the process of systematic inquiry. Course includes lecture, seminar and laboratory. Four class hrs. per wk; lab arranged. Prereq: Admission to graduate program.

620 *Clinical Nursing I.* (6)

Review and expansion on the process of collaborative efforts for health care, students continue the exploration of nursing care problems and increase their knowledge of systematic inquiry, nursing care and the transmission of knowledge. The focus expands to include greater opportunity for the pursuit of special interests. Four class hrs. per wk; lab arranged. Prereq: NUR 610. Lecture, total group and smaller groups, seminar and laboratory.

630 *Clinical Nursing II.* (6)

A continuation of Nursing 620. Focus is on the consolidation of learnings from nursing and cognate courses into a framework for advanced nursing practice with opportunity to test and evaluate results. our class hrs. per wk.; lab arranged. Prereq. NUR 620. Lecture, seminar and laboratory.

768 *Residence Credit for Master's Degree.* (0)

May be repeated once. (1-6 credits equivalence.)

781 *Independent Study in Nursing.* (1-3)

An elective course which gives the student an opportunity to explore independently a topic of special interest. May be repeated to a maximum of four credits. Prereq: Consent of adviser.

XIII. SOCIAL PROFESSIONS

The School of Social Professions offers a graduate curriculum of four semesters' duration, leading to the Master of Social Work degree (in accordance with Plan B). The MSW degree program is designed to prepare students for careers in social work. The school also offers a series of courses in its undergraduate Social Work Major Program which may be taken for graduate credit.

Requirements for the Degree of Master of Social Work

1. Completion of 54 units of credit with an average of not less than B: 40 units of which are in required courses and four of which are in elective courses within the graduate social work curriculum of the school.
2. All credits must be earned within a seven-year period.
3. Not less than 28 units of credit must be completed at the University of Kentucky. All social work transfer credits accepted for the degree must have been earned in a school accredited by the Council on Social Work Education.
4. Successful completion of a final comprehensive examination.

The MSW degree program is being developed in cooperation with the Council on Social Work Education. The application for Admission to Candidacy made by the school in December 1969 was approved by the Accreditation Commission of the Council on Social Work Education in January 1970. Final action on the application will be taken in January 1972 under the regulations prescribed by the Accreditation Commission of the Council on Social Work Education governing all accreditation applications.

Admission to the MSW Degree Program

Students are admitted to the MSW degree program only in the fall semester. Applications must be filed not later than April 15th, prior to entrance in the fall. Application forms and instructions may be obtained upon request from the Dean, School of Social Professions, Office Tower Building, University of Kentucky, Lexington, Kentucky 40506.

Applicants must meet the general requirements prescribed by the University for all graduate students as specified on pp. 15-24 of this bulletin.
Applicants must have:

(a) Received their A.B. degree before the beginning of the fall semester in which they wish to enroll and have achieved a grade point average on all work attempted of 2.5 or better on a basis of 4.0;

(b) Submitted all the information requested on the application for admission form, including a list of three references;

(c) Possess personal qualifications, as judged by the Committee on Admission, as suitable for the field.

Student Stipends

There are a limited number of student stipends and assistantships available. Communication regarding these should be addressed to the Dean, School of Social Professions.

SOCIAL WORK

444 *Field Instruction.* (6)
Supervised field instruction in a wide variety of problem settings.

445 *Field Instruction.* (6)
Intensive field experience in the specialized setting of the student's choice.

500 *Public Welfare Administration.* (3)
Philosophy, background, and methods of tax-supported social work. The interrelationship of federal, state and local services; standards and supervision as influenced by federal welfare legislation. Prereq: Permission of instructor.

505 *Child Welfare Services.* (3)
A study of community and national programs for child care and protection, including aid to dependent children and other social security services.

510 *Psychiatric Information for Social Workers.* (2)
An analysis of personality development and behavior patterns with special reference to psychiatric interpretations and their implications for social case work. Prereq: Permission of instructor.

516 *Social Work Research and Statistics.* (3)
A consideration of statistical and other types of research in social work problems with illustrations drawn from current studies of government and private welfare agencies. Prereq: Permission of instructor.

520 *Interventive Methods in Social Work.* (3)
A generic two-semester course in social work problem-solving skills. Theories underlying social work methods. Alternative strategies in individual, group and community change. Selected readings and case records will be used. Actual problems from the field as experienced by students will be discussed and analyzed.

521 *Interventive Methods in Social Work.* (3)
A continuation of the basic course in social work problem-solving skills.

541 *Administration and Supervision of Group Work Agency Programs.* (3)
The group work process as applied to agency administration, supervision of staff and volunteers, statistical and process recording, evaluation of program, personnel and committee relationships. Prereq: Permission of instructor.

600 *Field Laboratory.* (0)
Laboratory experiences in the field. Studies and observations in agencies, institutions, and community-at-large to explain and demonstrate the theoretical content of the base courses in first semester social work curriculum.

601 *Social Work Practice.* (4)
This course lays the basic foundation for the educational practicum and all advanced practice courses. It deals with the variety of strategies for intervention in problem-solving and helping processes in social work practice.

602 *Social Work Practice with Adults.* (2)
Study and analyses of problems in social functioning during the adult years with emphasis upon prevention, amelioration and restoration.

603 *Social Work Practice with Children and Youth.* (2)
Study and analysis of developmental crises and problems of children and youth. Emphasis upon social work strategies of intervention for prevention, amelioration or resolution.

620 *Human Growth and the Social Environment.* (4)
This course lays the necessary foundation for advanced courses in the biological, social, cultural, environmental, and psychological factors that influence human behavior.

621 *Psychopathology for Social Workers.* (2)
An intensive analysis and study of deviant personality and behavior patterns as they are applicable to the practice of social work. The theoretical basis will be reviewed.

630 *Social Welfare Policies and Services.* (4)
This course lays the basic foundation for sequential courses in this content area. Emphasis is on the study and understanding of the decision-making process involved in the development, formulation, implementation and impact of social welfare policies and services.

631 *The Role of Social Work in Social Reform.* (2)
The need for analysis and planning as the basis for action by social workers in their professional roles as agents of social change.

640 *Educational Practicum I.* (10)
Social work practice experience under faculty direction in a Learning-Teaching Center comprised of a complex of social agencies and institutions. Application of the problem-solving method to intervention with individuals, families, groups and communities toward social change. Knowledge and concepts from classroom learnings will be applied and tested in the practice situation.

650 *Problem-Solving Seminar I.* (2)
Selected major social problems and their causes are analyzed intensively. Emphasis is placed on social work interventions which are evaluated for their effectiveness in reduction and/or elimination of causes and harmful effects on people.

680 *Special Problems in Social Work Practice.* (2-4)
Current issues that have special significance for social work practice. Selected problems in accordance with the needs and interests of the students registered for the course.

690 *Research in Social Work.* (2)
Analysis and study of research and scientific process through critical evaluation of examples of social work and social research; identification of areas in which social work research is needed.

701 *Advanced Practice Theory.* (2)
Study and analysis of problem-solving processes with emphasis upon strategies of intervention relevant to particular target populations or service delivery systems.

730 *Public Social Policy and the Delivery of Social Services.* (2)
Critical study and analysis of social welfare policy needs, policy development and policy impact as related to citizen functioning and socialization.

731 *The Role of Social Work in Community Planning.* (2)
Study and analysis of the social work process through the critical evaluation of social welfare needs in urban renewal, health services, citizen participation in planning and other areas related to the humanization of community life.

740 *Educational Practicum. II.* (8)
Further field experience in a Learning-Teaching Center under educational direction. Continued application of classroom learnings in advanced methods of intervention. Emphasis will be upon leadership roles as in supervision, consultation, teaching and administration. Experience in decision-making and social policy formulation planned.

750 *Problem-Solving Seminar II.* (2)
Continuation of SW 650 or more advanced level of analysis.

770 *Seminar on Social Issues and Social Work Practice.* (2)
Seminar for second-year students on social issues which are currently vital to legislation, public concern and social action for the purpose of effecting changes in institutions and service delivery systems.

771 *Leadership Roles in Social Work I.* (2)
Study and analysis of leadership roles in social work practice. Introduction to theories of adult learning. Focus upon roles in supervision and consultation.

772 *Leadership Roles in Social Work II.* (2)
Continued study and analysis of social work leadership roles. Review of theories of adult learning. Focus on roles in teaching, staff development and administration.

776 *Principles and Methods of Field Instruction in Social Work I.* (2)
Designed for the agency social work personnel who will be assisting in the educational direction of social work students in agencies within the Teaching-Learning Centers. Theories of adult learning, and curriculum design as it relates to the education of social workers in the field, will be stressed.

777 *Principles and Methods of Field Instruction in Social Work II.* (2)
Continued study of curriculum design for field learning in social work. Learning opportunities to support integrated practice theory. Attention to evaluation of learning experiences and their outcome.

780 *Problems in Delivery of Social Services.* (2-4)
Emphasis on the factors impinging on the optimum delivery of social services.

790 *Methods in Social Work Research.* (2)
Intensified study of the research process with emphasis on design, sampling process, data collection, and analysis. For students seeking beginning skill in social work research.

Fellows and Trainees for 1970-71

UNIVERSITY OF KENTUCKY RESEARCH FOUNDATION FELLOWS

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James Enck ..... Sociology
Lowell Hibbard ..... Electrical Engineering
Jesse Mays ..... English
Eve Mouk ..... German
Joan E. Zantrofski ..... Foods & Nutrition

HAGGIN FELLOWS

I-Chen Chang ..... Chemistry
Kenneth J. Cheverton ..... Mechanical Engineering
Thomas D. Coskren ..... Geology
Harvey Grannis ..... History
Laurence Grossman ..... Physics & Astronomy
Susan Hassee ..... Mathematics
Charles C. Hay ..... History
Olga Impey ..... Spanish & Italian
Judith Janssen ..... English
Ronald Janssen ..... English
Marlene Kocan ..... Psychology
Stephen Kublank ..... Mathematics
Robert McClure ..... Education
Colin Martin ..... History
Richard Michener ..... English
Richard T. Mount ..... Spanish & Italian
Henry Muse ..... Statistics
Sateesh Nabar ..... Chemical Engineering
David Pang ..... Chemical Engineering
Laxmi Parasuram ..... English
James Powell ..... English
James Ramage ..... History
Simon Rusmin ..... Botany
Jesse Sherwood ..... Physics & Astronomy
Rodney Skaggs ..... Philosophy
John Strang ..... Philosophy
Richard Tseng ..... Chemical Engineering

PAUL I. MURRILL FELLOW

Ilse A. Boenig ..... Chemistry

JEFFREY FELLOWS

Karan Kaul ..... Botany
Abbas Nemati ..... Plant Physiology

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Jerry Gaines	Political Science
Carl L. Garrott	French
Judith J. Seibert	History
Steven A. Short	Biochemistry
William E. Woods	Biochemistry

PATTERSON SCHOOL FELLOWS

David Chester	Diplomacy
William Dawson	Diplomacy
Donald Ellerman	Diplomacy
William Fewell	Diplomacy
Manford Ledford	Diplomacy
Mary B. Millay	Diplomacy
Dietrich Schaupp	Diplomacy
Kathryn Shelton	Diplomacy
Stephen Traughber	Diplomacy
Barbara Winters	Diplomacy

NATIONAL SCIENCE FOUNDATION TRAINEES

Neil D. Adams	Physics & Astronomy
Gail Bryce	Statistics
Stephen A. Bullard	Mathematics
Richard A. Couto	Political Science
Sharon M. Cronch	Chemistry
Joseph W. Daniel	Mathematics
Dana L. Diedrich	Microbiology
Richard Engstrom	Political Science
Howard Gabennesch	Sociology
Richard Hornung	Statistics
Herbert Kuehne	Anthropology
Michael Laubacher	Statistics
Joseph LeClerc	Botany
Sally Ann McCreery	Animal Sciences
Barry K. McLean	Physiology & Biophysics
J. D. McGovern	Pharmaceutical Science
Randall C. Merris	Economics
J. S. Nelsen	Electrical Engineering
Joyanne G. Stephens	Sociology
William H. Swatos	Sociology

NATIONAL DEFENSE FELLOWS

David D. Adams	Biochemistry
William Arthur Bachman	Economics
John P. Baker, Jr.	Electrical Engineering

Wendy H. Baldwin ..... Sociology
John Paul Boyd ..... Spanish & Italian
Earl W. Bruce ..... Electrical Engineering
Barbara Anne Burr ..... Anatomy
David James Burt ..... English
Janet Sue Cabaniss ..... Economics
David Campbell ..... Agricultural Economics
S. Dare Davidson ..... Spanish & Italian
Sharon Ann Dennett ..... Physiology & Biophysics
Edward H. Dougherty ..... Psychology
Deanna B. Durbin ..... Sociology
Tom Douglas Fuller ..... Business Administration
Janet Gardner ..... Spanish & Italian
Michael W. Giles ..... Political Science
Harry M. Griggs ..... Economics
Elizabeth B. Guth ..... Microbiology
Louis Hamill ..... Economics
Dennis W. Harmon ..... Diplomacy
Elizabeth J. Hayford ..... English
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Jack L. Kreider ..... Animal Sciences
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Eugene R. McCane ..... History
William Howard McNew ..... History
Carolyn S. Martin ..... French
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Kay Lynne Miller ..... Spanish & Italian
Rodney Morman ..... Mathematics
Steven Murdock ..... Sociology
William Plummer ..... Sociology
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David Rymph ..... Anthropology
William A. Samsonoff ..... Microbiology
Marilyn Schuler ..... French
Christopher Sinback ..... Physiology & Biophysics
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Thomas L. Stengel ..... French
Sister Agnes Walsh ..... French

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George Lee Wyatt ..... Economics

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