

1972

1972-1973 Southern Illinois University Bulletin Carbondale Campus (Graduate Catalog)

Southern Illinois University Carbondale

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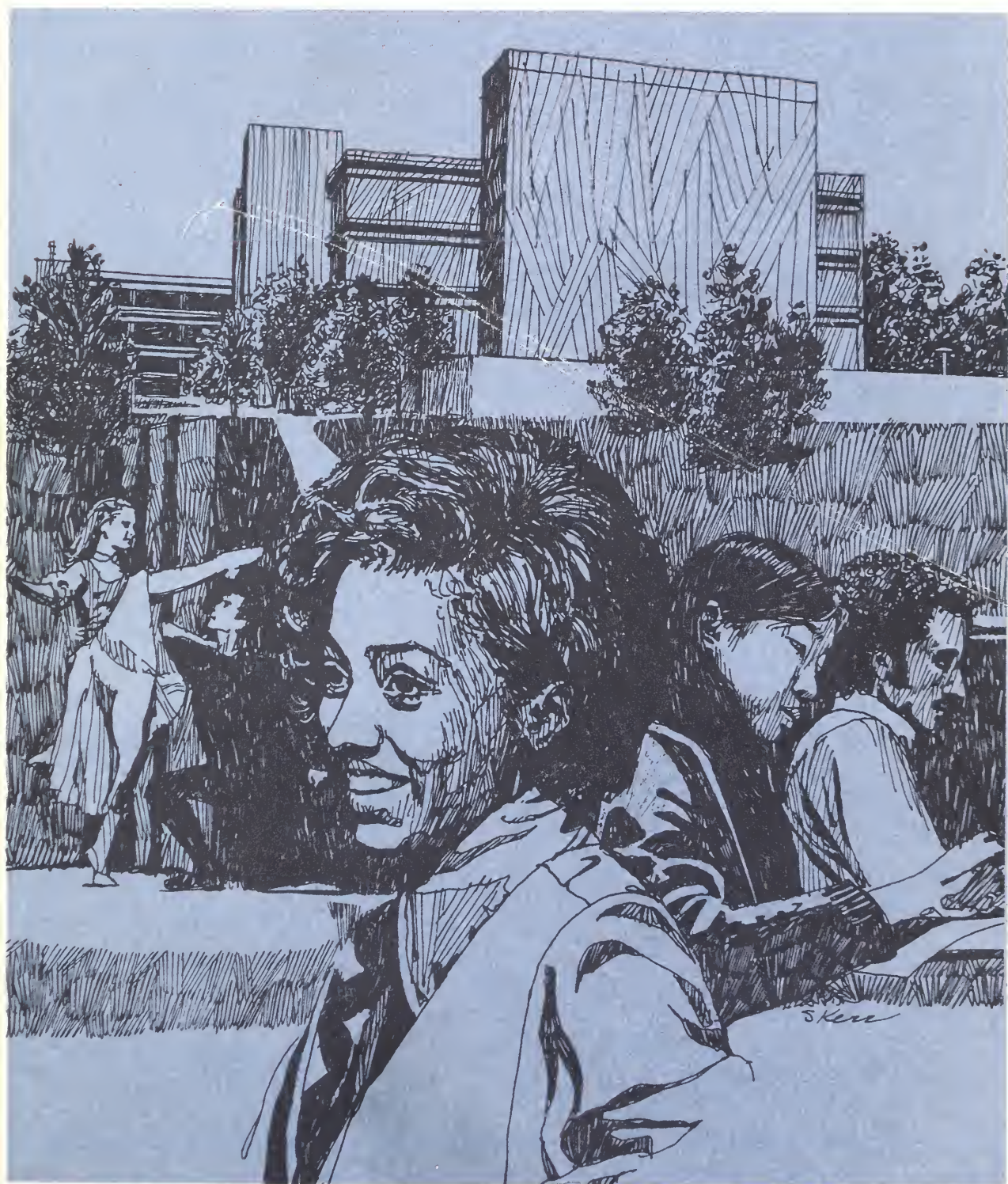
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Southern Illinois University Bulletin

1972/1973
Graduate Catalog
Carbondale

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OBJECTIVES OF SOUTHERN ILLINOIS UNIVERSITY

TO EXALT BEAUTY

*In God,
in nature, and
in art;
Teaching how to love the best
but to keep the human touch;*

TO ADVANCE LEARNING

*In all lines of truth
wherever they may lead,
Showing how to think
rather than what to think,
Assisting the powers
of the mind
In their self-development;*

TO FORWARD IDEAS AND IDEALS

*In our democracy,
Inspiring respect for others
as for ourselves,
Ever promoting freedom
with responsibility;*

TO BECOME A CENTER OF ORDER AND LIGHT

*That knowledge may lead
to understanding
And understanding
to wisdom.*

Southern Illinois University Bulletin

1972/1973
Graduate Catalog
Carbondale



Southern Illinois University Bulletin

Volume 14, Number 4

May 1972

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February, July, October, and December.

This Issue

of the *Southern Illinois University Bulletin* covers in detail questions concerning the Graduate School of Southern Illinois University at Carbondale. It supersedes Volume 13, Number 4.

THE FOLLOWING issues of the *Southern Illinois University Bulletin* may be obtained free from University Graphics and Publications, Southern Illinois University at Carbondale, Carbondale, Illinois 62901.

Graduate Catalog

Schedule of Classes. Please specify quarter (fall, winter, spring, or summer).

Undergraduate Catalog. The catalog is available for examination in high school guidance offices and libraries throughout Illinois and in some other states. Copies will be furnished free to educational institutions upon request and to new students upon matriculation. The catalog may be purchased at the University Bookstore for \$1; mail orders should be sent to University Graphics and Publications and must include remittance payable to Southern Illinois University.

Vocational-Technical Institute Catalog.

This publication is not a contract or offer to contract. The Board of Trustees, University executive officers, and their agents reserve the right to change information contained herein without notice when circumstances warrant such action.

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University Calendar

<i>WINTER, 1972</i>	Quarter Begins	Monday, January 3 *
	Washington's Birthday Holiday	Monday, February 21
	Final Examinations	Saturday–Friday, March 11–17
<i>SPRING, 1972</i>	Quarter Begins	Monday, March 27 *
	Memorial Day Holiday	Monday, May 29
	Final Examinations	Saturday–Friday, June 3–9
	Commencement	Friday, June 9
<i>SUMMER, 1972</i>	Quarter Begins	Monday, June 19 *
	Independence Day Holiday	Tuesday, July 4
	Final Examinations	Monday–Friday, August 28– September 1
	Commencement	Friday, September 1
<i>FALL, 1972</i>	New Student Days	Sunday–Tuesday, September 17–19
	Quarter Begins	Tuesday, September 19 *
	Thanksgiving Vacation	Tuesday, 10 P.M.–Monday, 8 A.M., November 21–27
	Final Examinations	Saturday–Friday, December 9–15
<i>WINTER, 1973</i>	Quarter Begins	Tuesday, January 2 *
	Washington's Day Holiday	Monday, February 19
	Final Examinations	Saturday–Friday, March 10–16
<i>SPRING, 1973</i>	Quarter Begins	Monday, March 26 *
	Memorial Day Holiday	Monday, May 28
	Final Examinations	Saturday–Friday, June 2–8
	Commencement	Friday, June 8
<i>SUMMER, 1973</i>	Quarter Begins	Monday, June 18 *
	Independence Day Holiday	Wednesday, July 4
	Final Examinations	Monday–Friday, August 27–31
	Commencement	Friday, August 31
<i>FALL, 1973</i>	New Student Days	Sunday–Tuesday, September 23–25
	Quarter Begins	Tuesday, September 25 *
	Thanksgiving Vacation	Tuesday, 10 P.M.–Monday, 8 A.M., November 20–26
	Final Examinations	Wednesday–Tuesday, December 12–18
<i>WINTER, 1974</i>	Quarter Begins	Wednesday, January 2 *
	Washington's Day Holiday	Monday, February 18
	Final Examinations	Wednesday–Tuesday, March 13–19

* Classes begin with the evening classes after 5:30 P.M.

Board of Trustees

Southern Illinois University

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1 / The Graduate School

The Role of the Graduate School

The primary concern of the Graduate School is graduate instruction and research at Southern Illinois University at Carbondale. The Graduate School therefore plays an essential role in the development of instructional and research programs, in the acquisition of funds, and in the procurement of facilities necessary to encourage and support the research of the members of its scholarly community. In addition, the Graduate School is a major contributor to the public services provided by the University to the region, the state, the nation, and a number of other countries. In all of its programs of instruction and research, the Graduate School sets a high standard of achievement. It is in those students who have demonstrated this quality of excellence by completing advanced courses of study and by achieving significant results in their research that the Graduate School makes its contribution to the public welfare.

Research is of special concern because the faculty must engage in scholarly research activities to maintain its effectiveness and also because advanced instruction of graduate students consists mainly of guidance in research. For these reasons, University policies governing research are developed by the Graduate School and administered through it. The Graduate School assists in the continuing development of the research activities of the University. University support for individual research projects is available to faculty members through the special research projects program administered by the Graduate School. The Graduate School also supervises cooperative research projects and particularly assists applicants in the preparation and submission of research proposals that involve outside support from such sources as government, foundations, business, and industry.

Morris Library

Morris Library contains over 1,400,000 volumes and subscribes to more than 10,000 periodicals. Over 100,000 volumes have been added to the collection in each of the last three years. In addition to books and journals, the library has extensive collections of maps, manuscripts, and films. Morris Library is also a depository for federal, state, and U.N. documents. A major source for research in the behavioral sciences is the Human Relations Area files, consisting of copies of some 3,000,000 documents, books, articles, and manuscripts covering 170 world cultures.

Supplementing the resources of Morris Library is the Center for Research Libraries, in which the University holds membership. A printed book catalog of the center's some 2,000,000 volumes is available for con-

sultation. The extensive scientific journal collection of the Argonne National Laboratory is also available to graduate students in person or on interlibrary loan.

Information Processing

The Information Processing unit supports both the academic and the administrative needs of the University. A sizable instructional activity as well as the research activity of both faculty and students is supported. The center is presently equipped with an IBM System 360, model 65, an IBM 1130, and an IBM 1401. A variety of sorting and tabulating equipment is also available.

Academic support activities of the center include maintenance of a research program library, consulting about computing problems, and non-credit instruction in computing. Arrangements can be made for both faculty and graduate students to use the services and facilities of the center at no personal cost.

Placement Services

The Placement Services assists students and alumni seeking career employment. Maximum benefit from its services is assured for students who file their resumes approximately three quarters prior to graduation. Alumni should periodically up date their resumes which are placed on permanent file. All inquiries concerning this free service should be made to the director of the Placement Services.

Housing

There is no on-campus housing for single graduate students. Therefore, they will find it necessary to locate private housing facilities.

The Housing Information Center, Washington Square, Building C, maintains current information on rooms, apartments, houses for rent or sale, and trailer parks. The staff of this center will assist students in location of accommodations. Experience has shown that satisfactory arrangements cannot be made by mail. A personal visit is usually required. Prices vary widely, ranging from \$20 a month for trailer spaces to \$150 a month or more for houses and apartments.

All arrangements for off-campus housing and all business transactions in the matter of this type of housing are the sole responsibility of the student and owner of the housing facility.

University-owned housing for married students includes 304 unfurnished two- or three-bedroom air-conditioned apartments; 272 furnished efficiency, one-, or two-bedroom apartments; and a 53-space trailer court.

Because the demand for University housing for married students exceeds the supply, information should be requested early from Housing Business Services, Washington Square, Building D.

Health Services

The Health Service provides medical care to include 24-hour emergency service to graduate students who pay the student activity fee. The

Health Service offers X-ray, laboratory, pharmacy, infirmary, and physician services. Those students that elect not to pay the student activity fee may utilize the medical services on a fee-for-service basis.

Financial Assistance

Fellowships, Preceptorships, Internships, and Assistantships

Inquiries may be addressed to department chairmen.

Graduate fellowships are available in all areas of graduate study upon application to the appropriate chairman, and are awarded by the graduate school on the basis of scholarship. The award is normally made for four consecutive quarters; for master's degree students the stipend is \$255 per month, or \$3,060 for the four quarters; for doctoral degree students the stipend is \$275 per month, or \$3,300 for four consecutive quarters. There is a remission of tuition but not other fees. There is no service requirement. All application materials should be submitted to the student's major department chairman before February 1 preceding the academic year for which the fellowship is desired.

Special doctoral assistantships are available for students who hold the master's degree, or its equivalent, from another institution, and who have been admitted to one of the doctoral programs. Application is made to the appropriate chairman, and the awards are made by the graduate school upon the basis of scholarship. The award is normally made for four consecutive quarters and carries a stipend of \$330 per month, or \$3,960 for four quarters. Extension to an additional four quarters is possible upon recommendation of the department chairman. There is a remission of tuition but not other fees. There is a service requirement, with the specific duties to be assigned by the chairman of the department. Application deadlines and procedures are the same as for graduate fellowships.

A number of preceptorships are offered by the University to students who are excellent teachers as well as superior scholars. These positions pay a stipend which ranges from \$300 to \$375 per month for the academic year, with the exact amount depending upon assignment, experience, and academic achievement. Remission of tuition is granted, but fees must be paid. Service of 20 hours per week, or corresponding load in teaching, is required. Preceptors must carry no more than 12 hours and no less than 6 hours of credit per quarter. Application should be made to the appropriate chairman before February 1 preceding the academic year for which the assignment is sought.

Teaching, research, and graduate assistantships, and graduate internships are available in a number of departments and from research agencies. These positions pay stipends which range from \$240 to \$350 per month, with the exact amount depending upon the assignment, experience, and academic achievement of the student. Rules applying to tuition, fees, and service loads are the same as those for preceptorships.

Student Work and Financial Assistance Office

The University maintains an Office of Student Work and Financial Assistance through which work on and off campus, cooperative work-study programs, summer employment, the federal work-study programs, and

scholarships, awards, prizes, grants-in-aid, private agency awards, and student loan funds are negotiated.

Additional information may be obtained from the director of Student Work and Financial Assistance program.

Tuition and Fees

The tuition and fees charged students are established by the Board of Trustees and are subject to change whenever conditions make changes necessary. Fees per quarter for graduate students are as follows:

	Not more than 5 hrs	More than 5, less than 11	11 or more
Tuition—Illinois Resident	\$ 48.00	\$ 95.00	\$143.00
Tuition—Out-of-State Resident	(143.00)	(286.00)	(429.00)
Student Welfare and Recreation			
Building Trust Fund Fee	5.00	10.00	15.00
Student Activity Fee	3.50	7.00	10.50
Student Center Fee	5.00	10.00	10.00
Athletic Fund Fee	3.00	6.50	10.00
<i>Total</i> —Illinois Resident	\$ 64.50	\$128.50	\$188.50
<i>Total</i> —Out-of-State Resident	(\$159.50)	(\$319.50)	(\$474.50)

The student activity fee includes the fees for limited hospitalization, entertainment, the student newspaper and yearbook, and such other privileges as may be provided.

Teaching, research, and graduate assistants, graduate interns, and graduate fellows do not pay tuition and have an option on paying the student activity fee. They pay other fees.

NDEA (Title IV) fellows and NSF trainees pay neither fees nor tuition.

In addition to the above fees, a student is subject to certain other charges under the conditions listed below:

1. A matriculation fee of \$5, which is assessed a graduate student the first time he registers if he is not a graduate of Southern Illinois University.

2. A late registration fee of \$5.00 when a student registers after the regular registration period has ended.

3. A graduation fee of \$9; and, for doctoral candidates, a dissertation microfilming fee of \$25–\$40, depending upon the service selected.

4. Other charges which a student may incur are those for field trips, library fines, and excess breakage. A student taking a course involving use of materials, as distinct from equipment, will ordinarily pay for such materials.

Residency Status for Assessment of Tuition

Regulations defining the residence of students for purposes of registration in Southern Illinois University are as follows:

1. Evidence showing the residence of every applicant for admission to the University must be submitted at the time of application for admission,

and resident or nonresident fees shall be assessed on the basis of evidence appearing in the registrar's records.

2. In all cases where the records indicate that the student's home is outside the state of Illinois, the nonresident fee shall be assessed. A student who takes exception to the ruling may file a claim for a refund, but this must be submitted to the registrar within 10 days of the opening date of the quarter for which the charge was made.

3. In the case of a student who is a minor, the residence of the parent, or if the student has no parent, the guardian of this person, shall govern unless there is proven to have been complete emancipation of the minor from his parents or guardian and he has established residence in the state of Illinois.

4. Any student, adult or minor, whose parents have established a bona fide residence in the state of Illinois will be regarded as a resident for registration purposes; except that an adult student who has established a residence on his own account outside of the state must conform to the terms set forth in regulation 6 to be classified as a resident.

5. A wife or husband is classified as a resident for registration purposes if his or her spouse is a bona fide resident of the state of Illinois preceding and at the time of their registration.

6. An adult student whose parents are deceased or whose parents reside outside the state, to be considered a resident of Illinois for purposes of registration must be a bona fide resident of the state for one year preceding the beginning of any quarter for which he registers at the University and must present evidence that he is self-sustaining and not under parental control.

7. An adult alien who holds valid immigration papers and is in the United States under an immigrant-type visa may qualify as a resident of the state for purposes of registration in the University if he has lived within the state for at least a period of twelve months next preceding the beginning of any quarter for which he registers at the University, subject to the provisions of rules 4 and 6.

8. Several factors will be considered in the determination of each individual case. Among the factors to be considered will be (a) location of draft board registration, (b) voting address, if any, (c) the degree of self-support of the student, (d) location of summer or vacation employment.

9. All cases of appeal shall first be referred to the legal counsel of the University. An appeal from the legal counsel shall be in accordance with University statutes.

Note: In the above regulations an adult student is considered to be at least 18 years of age.

Graduate Degrees Offered

Graduate degrees are available in the following fields:

Master of Arts

Anthropology	Economics	French
Behavior Modification	English	Geography
Biological Sciences	English as a Foreign	Geology
Botany	Language	German

Government
History
Inter-American
Studies
Journalism
Linguistics
Mathematics
Microbiology

Philosophy
Physics
Physiology
Psychology
Rehabilitation
Administration
Rehabilitation
Counseling

Sociology
Spanish
Speech
Speech Pathology and
Audiology
Theater
Zoology

Master of Business Administration

Business Administration

Master of Fine Arts

Art

Master of Music

Music

Master of Music Education

Music

Master of Science

Administration of
Justice
Agricultural Industries
Animal Industries
Applied Science
Behavior Modification
Biological Sciences
Botany
Chemistry and
Biochemistry
Community
Development
Computer Science

Design
Economics
Engineering
Forestry
Geography
Geology
Home Economics
Journalism
Mathematics
Microbiology
Occupational
Education
Physics

Plant Industries
Psychology
Rehabilitation
Administration
Rehabilitation
Counseling
Sociology
Speech
Speech Pathology and
Audiology
Theater
Zoology

Master of Science in Education

Early Childhood
Education
Educational
Administration and
Foundations
Elementary Education
Guidance and
Educational

Psychology
Health Education
Higher Education
Home Economics
Education
Instructional
Materials
Occupational

Education
Physical Education
Recreation and
Outdoor Education
Secondary Education
Secretarial and
Business Education
Special Education

Doctor of Philosophy

Anthropology
Botany
Chemistry and
Biochemistry

Economics
Education
English
Geography

Government
Historical Studies
Journalism
Mathematics

Microbiology
Molecular Science
Philosophy
Physiology

Psychology
Sociology
Speech/Theater
Speech Pathology and

Audiology
Zoology

Admission to Graduate Study

A student should obtain application forms from the Graduate School and submit application, with other supporting material, directly to the Graduate School where it will be evaluated for compliance with Graduate School admission requirements. The student must have the registrar of each college previously attended (except Southern Illinois University at Carbondale) send three official transcripts of his record to the Graduate School. Copies sent to a department are not acceptable. Unofficial or personal transcripts are not acceptable. The recording of one or more college's grades upon the transcript of another college does not meet the requirement. No transcripts or other admission credentials will be returned or forwarded to other institutions. Only if these steps are taken and if the student seeks a degree will the application be forwarded to the department * in which the student indicates his desired major. The admission requirements of the Graduate School and the department must both be met before the student is admitted either conditionally or unconditionally, and both the Graduate School and the department may specify conditions. Several departments require additional materials such as test scores or letters of recommendation. The student will be informed of his admission status after this process has been completed. Admission to the Graduate School is determined almost entirely by the caliber of the applicant's previous college work.

An applicant should see to it that all required admissions materials are submitted to the Graduate School no later than 30 days prior to the beginning of the quarter for which he is seeking admission. An applicant to a degree program whose materials are received too late for processing may be granted unclassified (late entry) admission status for the quarter for which admission was originally sought. The application papers will continue to be processed for admission to a degree program for the quarter following the one originally applied for. Whether work taken by a student who is unclassified because of late application will later count toward a degree will be decided by the Graduate School and the department concerned.

A student who wishes to enter the Graduate School immediately after receipt of the bachelor's degree may submit his application when he is within one quarter or semester of graduation, that is, when his transcript shows that he has earned at least 105 semester hours or 160 quarter hours of undergraduate credit which is applicable to his bachelor's degree. A student who has an overall undergraduate grade point average of at least 4.00 ($A = 5.00$) may apply for admission when his transcript shows that he has earned at least 96 semester hours or 144 quarter hours of undergraduate credit which is applicable to his bachelor's degree.

In all cases, admission to the Graduate School is final only when an

* The word "department" is used here to designate any academic or administrative unit offering work leading to one or more graduate degrees.

official transcript which certifies that the applicant has been awarded a bachelor's degree is received in the Graduate School office.

A student who is applying to a department for an assistantship or fellowship and who submits a transcript in support of that application must also submit an application for admission and transcripts directly to the Graduate School for admission processing.

Admission to Graduate Study on an Unclassified Basis

A person may apply for admission to the Graduate School as an unclassified student when he does not seek a graduate degree or certificate, or when he has applied too late to be admitted to a degree program for the quarter for which he seeks admission. A person who seeks admission as an unclassified graduate student must present evidence that he holds a bachelor's degree and that his overall undergraduate grade point average is 3.40 or higher ($A = 5.00$).

Admission of International Students

A student from abroad is subject to all requirements for admission established by the Graduate School. In addition, he must complete special forms pertaining to the admission of international students. For these admission forms and for other information concerning international students, inquiries should be sent to the Assistant Director of Admissions, International Student Division, Office of Admissions and Records, Southern Illinois University, Carbondale, Illinois 62901.

All foreign-born applicants must apply through the foreign admissions office unless they are certified as residents by the Office of Admissions and Records.

To allow ample time for visa and other departure procedures, the applicant should have his application and all supporting documents on file with the University no less than four months prior to his proposed entry date.

An international student must be enrolled in a program leading to a graduate degree. He cannot be admitted as an unclassified student.

If the above requirements are satisfactorily met and the student is admitted to a degree program, he will be required to certify that he has adequate financial resources available to him to undertake and continue in a program of study.

Test of English as a Foreign Language (TOEFL)

All foreign-born applicants not admitted under paragraph one under *Academic Requirements* listed below whose primary spoken language is not English must achieve a TOEFL score of 550. This test must have been taken no more than 12 months prior to the quarter for which the applicant is seeking admission.

Academic Requirements

If a foreign-born applicant has completed a four-year bachelor's degree program at an accredited institution in the United States of America, the applicant may be given the same consideration for admission to a graduate degree program as a United States citizen, in regard to both academic requirements and the use of English as a foreign language.

If a foreign-born applicant has completed the equivalent of a four-year

baccalaureate degree in any other country, or at an unaccredited institution, the applicant must have an academic record equivalent to a 3.70 grade average ($A = 5.00$) for admission to a graduate degree program.

The determination of the applicant's grade point average shall be the responsibility of the Office of Admissions and Records, International Student Division.

Retention

A student admitted on an unconditional basis (a master's level student whose undergraduate GPA is 3.70 or above or an advanced level student whose graduate GPA is at least 4.25), and who has earned 16 or more quarter hours of credit in graduate courses (400- or 500-level courses) will be placed on academic probation when his cumulative GPA for graduate course work falls below 4.00. A student admitted conditionally because of low grades is on academic probation from the time of admission.

A student who is currently on academic probation and has been on academic probation for at least one quarter, and who has earned at least 24 quarter hours of credit in graduate courses, will be dropped from the Graduate School if he has received eight or more hours of *C* in graduate courses which are not balanced by hours of *A* in graduate courses, or in any case in which it would take at least eight additional hours of *A* work to bring his graduate grade point average up to 4.00. Four examples of cases where a student would be dropped: eight hours of *C* and no hours of *A*; ten hours of *C* and two hours of *A*; four hours of *C*, two hours of *D*, no hours of *A*; five hours of *C*, one hour of *E*, and no hours of *A*. A student who is dropped from the Graduate School under these conditions will not again be eligible for admission to the Graduate School.

Undergraduate Student Registration in Graduate Courses for Graduate Credit

An undergraduate student who wishes to register for a graduate course (any 400- or 500-level course) for graduate credit must file the standard application for admission to the Graduate School. If he is admitted to the Graduate School, he will not be allowed to register for graduate courses for graduate credit until he is within 16 quarter hours of receipt of the bachelor's degree. At that time his registration will be permitted, subject to all of the approval procedures in effect for graduate students who have already received the bachelor's degree, together with final approval by the Graduate School. After having received such approvals an undergraduate student will be allowed to take graduate courses for graduate credit for two quarters. If, at the end of two quarters, he has not received the bachelor's degree, his permission to enroll in graduate courses for graduate credit will be withdrawn until after he has received the bachelor's degree.

Undergraduate Credit for 500-Level Courses

Undergraduate students are permitted to register for 500-level course for undergraduate credit only by special permission of the graduate dean. Such permission will be granted only to properly qualified students. The procedure for obtaining such permission is as follows: The chairman of the department offering the course, in collaboration with the instructor

who is teaching the section of the course in which the student desires to enroll, and in consultation also with other appropriate persons such as the director of graduate studies for the department, should write a letter to the graduate dean indicating the special reasons why the particular student should be allowed to take a particular 500-level course for undergraduate credit. Such a request should be made only for a truly superior student, and there should be a clear expectation that the student would perform above the median of graduate students in the course. The letter should therefore include some information on the student's academic work with particular attention to advanced and relevant courses in the major area. There should also be an explanation of why the student's needs cannot be adequately satisfied by undergraduate courses. Any information that explains the unique features of this particular student's case and justifies special approval will be helpful. Appropriate grade point averages should be included. If the petition is granted, a letter will be sent from the graduate dean to the registrar, asking that the specified credit be accepted in the student's undergraduate program.

Master's Degree Programs

Admission

In order to receive unconditional admission to the Graduate School for study at the master's level, the applicant must hold a bachelor's degree and have an overall undergraduate grade point average of 3.70 or higher ($A = 5.00$).

A student with a grade point average between 3.40 and 3.70 may be granted conditional admission and will remain on conditional status until he earns 24 quarter hours of credit in graduate-level courses. The faculty of a degree program unit may add its own grade point average requirements and other conditions for admission to that particular program. Students who are denied admission to a degree program may enroll as unclassified students. If, at a later date, they are admitted to a degree program, none of the credit hours they acquired as unclassified students may be counted towards their degree.

A student whose overall undergraduate grade point average is below 3.40 may be admitted to the Graduate School only by special permission of the graduate dean. A student who wishes to request such permission must write a letter formally requesting that an exception to the grade point average rule be made in his case, stating his reasons for believing that special consideration is warranted and indicating when he expects the following information to have been received in the Graduate School office: (1) scores on the aptitude test of the Graduate Record Examination (GRE) or on other standard tests such as the Miller Analogies Test; (2) at least three letters of recommendation on his behalf from persons who are professionally qualified to judge his promise as a graduate student in his proposed specialty; (3) a very strong letter of support from the degree program to which he wishes to apply. If a student has requested special permission for an exception to the grade point average rule, the Graduate School office will calculate his grade point average for his last two years of undergraduate work and for his undergraduate major; at least one of these grade point averages should be above 3.70. If the graduate dean approves admission to the Graduate School for a student whose grade point average is less than 3.40, the student must still obtain admis-

sion to a graduate degree program, since he will not be permitted to register as an unclassified student.

General Requirements

Graduate credit earned in graduate courses for which the student has received grades of *A*, *B*, *C*, or *S*, and only such credit, is acceptable for master's degree programs. An overall grade point average of at least 4.00 in all graduate work included in the master's degree program is required before that degree can be awarded. Forty-eight hours of acceptable graduate credit are required for a master's degree, except in fine arts, where 60 hours are necessary, and in behavior modification, psychology, rehabilitation counseling, and college student personnel work, where 72 hours are required. At least 24 hours must be earned in courses numbered 500 or above. No more than 16 hours earned for work done on campus at another university (for this purpose Southern Illinois University at Edwardsville is considered to be another university) or in extension from Southern Illinois University at Carbondale, or any combination of the two, may be counted toward the degree. An evaluation of transfer credit is made in every case and may result in a reduction of the credit offered. No transfer credit will be given for work bearing a grade below *B*. No credit toward the degree may be earned by correspondence.

Only credit earned within a six-year period preceding the completion of requirements for the degree, whether at Southern Illinois University at Carbondale or elsewhere, will be counted toward the degree.

Each candidate for a master's degree shall write a thesis except where a graduate program has been approved by the Graduate Council to provide for some other arrangement, such as a research paper. The thesis may be counted for not more than nine nor less than five quarter hours of credit. Two copies of the approved thesis must be presented to the Graduate School at least three weeks prior to the date of graduation, to be bound and shelved in the library. For nonthesis programs, a research paper should show evidence of the student's knowledge of research techniques and should be based on a special project or specific courses as may be recommended by the advisory committee.

Each candidate for a master's degree is required to pass a comprehensive examination covering all of his graduate work, including the thesis. This examination may be written or oral, or both, as determined by the student's advisory committee.

Candidates are expected to meet requirements in force during the year of graduation, but due consideration will be given the fact that a student may have been admitted and may have planned his work when other requirements were current. Important changes in requirements are put into effect gradually.

Application forms for graduation, which are to be secured from the Registrar's Office, should be completed and returned to that office after payment of the graduation fee at the Bursar's Office, at least five weeks prior to the graduation date.

Sixth-Year Specialist Certificate Program

The sixth year specialist certificate program is for a qualified student with a master's degree or its equivalent, as determined by the specific department, who wishes to pursue a specialization in an educational field. Sixth

year courses of study are offered in the professional education areas of educational administration, elementary education, guidance, secondary education, and special education.

Students seeking admission to the sixth year specialist certificate program follow the same procedures that apply for admission to other graduate programs. Admission to the sixth year specialist certificate program requires a grade point average of 4.25 ($A = 5.00$) for all previous graduate work. Departments may establish a higher scholastic requirement for admission and may use other selective criteria appropriate to the field of specialization. The student's previous work shall have provided a proper base of general and special preparation for the sixth year studies; if this is lacking, additional work must be taken to establish this base. Two years of experience relevant to the specialized field are required.

An advisory committee of three members for each candidate shall be appointed by the dean of the Graduate School upon the recommendation of the chairman of the respective department.

A minimum of 45 quarter hours of work beyond the master's degree or its equivalent is required. This work must be planned early by the student and his advisory committee, must clearly lead the student toward the specialization he seeks, and must conform to the sixth year specialist program approved by the Graduate Council. A minimum grade point average of 4.25 for all work in the sixth year specialist certificate is required for completion of the program. No more than nine hours earned for work done on campus at another university (for this purpose Southern Illinois University at Edwardsville is considered to be another University) or in extension from Southern Illinois University at Carbondale, or any combination of the two, may be counted toward the degree. All such work must be approved by the student's advisory committee and must carry a grade of *B* or better. No credit earned through correspondence or used in obtaining another degree or certificate may be counted.

A field study is required of each candidate for the specialist certificate. A written report of the field study is to be submitted to the student's advisory committee before a final oral examination. After the advisory committee approves the field study report, one copy will be forwarded to the Graduate School to be placed in Morris Library.

All credit must have been earned within seven years prior to the completion of the program.

The residency requirement is fulfilled by the enrollment of at least 12 quarter hours in a single quarter or of at least eight quarter hours in each of two quarters.

Doctor of Philosophy Degree Program

Admission

Admission to a Ph.D. program in the Graduate School requires a master's degree or its equivalent, a grade point average in graduate work of at least 4.25, and acceptance by the academic unit offering the Ph.D. program. The graduate dean informs each student of any conditions for admission imposed by the Graduate School or by the academic unit.

General Requirements

The Ph.D. degree is awarded for high accomplishment in a particular discipline or a recognized interdisciplinary area, as measured by the stu-

dent's ability to pass the preliminary examination for admission to candidacy, meet the research tool requirement of the program, perform a piece of original research, present the results in proper form in a dissertation, and defend the dissertation before a faculty committee.

Preliminary Examination

The student will generally prepare himself for this examination through independent study and course work, as advised by the faculty of his Ph.D. program. The examination is given to determine the breadth and depth of the student's knowledge within his discipline. The particular form and content of the examination are determined by the faculty of each of the doctoral programs. The student will be permitted to take the preliminary examination at the discretion of the department, after he has completed two years of full-time study or its equivalent beyond the baccalaureate.

Research Tool Requirement

The Ph.D. at Southern Illinois University at Carbondale is a research-oriented degree. The research tool requirement is intended to be an integral part of the student's program. Since research materials, problems, and techniques vary from discipline to discipline, the details of the research tool requirement are determined by the faculty of each of the doctoral programs.

Admission to Candidacy

Each student accepted for study into a doctoral program is admitted on a provisional basis and remains so until he has been admitted to candidacy for the degree. Admission to candidacy is granted by the dean of the Graduate School upon recommendation of the faculty responsible for the student's program, after the student has passed his preliminary examination and met the research tool requirement of the program. The Ph.D. degree may not be conferred less than six months, nor more than five years, after admission to candidacy, except upon approval of the dean of the Graduate School. If completion of requirements is delayed beyond five years, a student may be required to take another preliminary examination and be admitted to candidacy a second time.

Dissertation

After being admitted to candidacy, the student must complete a dissertation showing that he is capable of independent research or other creative effort. The dissertation shall be supervised by a faculty committee which has been approved by the dean of the Graduate School. This committee shall consist of five faculty members, one of whom shall be from a graduate program outside the student's academic unit.

While the student is working on his dissertation he must register for the course numbered 600. The student is to devote at least one academic year of full-time work to complete the dissertation; he will register for 36 quarter hours of dissertation credit, for example, 12 hours for each of three terms.

The student must submit two copies of the dissertation acceptable to the Graduate School, along with an abstract of 600 words or less. All dissertations will be microfilmed. There is a fee of \$25.00 to cover the cost of publication of the abstract and microfilming of the dissertation. If copyright is desired, an additional fee of \$15.00 will be required.

Final Examination

There will be a final oral examination administered by the student's doctoral dissertation committee. It will cover the subject of the dissertation and other matters related to the discipline.

Residency

In order to earn the Ph.D. one must be a full-time student on campus for a minimum of three consecutive quarters. This means in particular that during this period of three consecutive quarters the student should not be on more than half-time University appointment. Typical of such appointments are teaching and research assistantships.

Interdisciplinary Doctor of Philosophy Programs

These guidelines provide for interdisciplinary Ph.D. programs for a limited number of students whose educational requirements can be met by existing resources but not exclusively by any one of the University's constituent units. Interdisciplinary Ph.D. programs will be instituted in response to the particular academic interest of individual students, not as programs of a permanent nature. The procedures and criteria given below govern the authorization and control of interdisciplinary Ph.D. programs.

1. After completion of one year of full-time academic study in an established doctoral program at Southern Illinois University at Carbondale and upon the recommendation of the chairman or adviser of that program, a student may apply for an interdisciplinary Ph.D. program to the dean of the Graduate School.

2. The dean of the Graduate School will apply the following criteria in deciding whether a program committee should be established to consider the proposed interdisciplinary Ph.D. program.

- a. The requisite staff must be available.
- b. The library holdings must be adequate without unreasonable additions.
- c. The program must lie within the recognized disciplines or fields of study, at least one of which offers the Ph.D. program.

3. If the dean of the Graduate School is satisfied that the proposed program satisfies these criteria, he shall form a special program committee of five members, three of whom shall be from units offering the Ph.D.

4. If the committee approves the proposed program, a plan of study shall be developed that includes the following elements:

- a. Fields or areas of study
- b. Required courses
- c. Languages or other research tool requirements
- d. Dissertation subject

5. The program as approved by the committee and accepted for principal sponsorship by a unit with an approved Ph.D. program shall be submitted to the dean of the Graduate School. Upon his final approval the student's program shall have the same binding effect upon the Graduate School as programs printed in the graduate catalog. The degree earned shall carry the title of the doctoral unit that has assumed principal sponsorship. The commencement program shall give specific indication that the degree is interdisciplinary and include a listing of those units

that are substantively involved in addition to the principal sponsoring unit, as determined by the graduate dean.

6. When the committee has certified all the required performances, including the results of examinations, the committee shall be dissolved.

Advisement

Each student admitted to the Graduate School is expected to consult a graduate adviser in the department or faculty of his major for assistance in planning his total program and in choosing courses each quarter. As soon as the student gains approval for a thesis topic and a thesis director, the latter is designated as chairman of the advisory committee. This committee advises the student in the preparation of the thesis or dissertation, evaluates its quality when completed, and supervises the final examination, written or oral, when one is required.

A graduate student is expected to plan his work carefully. Program changes after registration must be approved by the student's adviser and the dean of the Graduate School. They may involve payment of a program-change fee. Program-change forms may be obtained from the Graduate School office.

The graduate student must assume responsibility for his progress by keeping an up-to-date record of the courses he has taken and by consulting periodically with his adviser. Responsibility for errors in program or in interpretation of regulations of the Graduate School and the University rests entirely upon the student. It is the student's responsibility to see that his records in the Graduate School office, Office of Admissions and Records, and with his major adviser are brought together well in advance of the time of graduation. The student cannot be approved for graduation unless these records are available at least six weeks in advance of the time of graduation. Advice is always available on request.

Registration

Registration takes place in the Graduate School office. Only those students who have been officially admitted by the Graduate School will be permitted to register. Students should register in person. There is no registration by mail. A student who has been admitted to a degree program begins the registration process by consulting a graduate adviser in his major department before coming to the Graduate School office. Unclassified nondegree students begin registration immediately at the Graduate School office. Information concerning registration dates and deadlines for the first quarter a student attends the University will be sent to him at the time he is admitted to the Graduate School. Continuing students should consult the schedule of classes for each quarter to find deadlines and dates for their registration.

Student Course Loads

Maximum course work for graduate students is 18 hours each quarter; 12 hours is considered a normal load. The maximum load for teaching, research, and graduate assistants who are employed half-time is 12 hours and the minimum is 6 hours; for assistants who are employed more than

half-time the maximum is 8 hours. For persons attending the eight-weeks summer session the maximum is 12 hours. Graduate Fellows must take a minimum of 10 hours per quarter; NDEA (Title IV) fellows and NSF trainees are required to register for 11 to 18 hours per quarter. Exceptions to these maxima and minima are possible only with the written permission of the graduate dean.

Graduate Advisers

Following is a list of chief academic advisers to students pursuing a graduate degree.

- | | |
|---|---|
| Administration of Justice—Thomas Eynon | Family Economics and Management—Betty Jane Johnston |
| Agricultural Industries—Walter J. Wills | Food and Nutrition—Frank Konishi |
| Animal Industries—G. B. Marion | Forestry—John Andresen |
| Anthropology—Edwin A. Cook | French—Maxine Vogeley |
| Applied Science—Thomas Jefferson | Geography—Theodore Schmudde |
| Art—Milton Sullivan, Thomas Walsh | Geology—Russell Dutcher |
| Art Education—Roy Abrahamson | German—Helmut Liedloff |
| Behavior Modification—Robert Campbell | Government—Earl Hanson |
| Biological Sciences—Edwin Galbreath | Guidance and Educational Psychology—John Deichmann, Robert Graff, Reed Williams |
| Botany—Robert Mohlenbrock | Health Education—Charles E. Richardson, Derward Grissom, James E. Aaron |
| Business Administration—Gola E. Waters | Higher Education—John E. King, Malvin Moore, Donald Tolle |
| Chemistry—Richard Arnold, C. D. Schmulbach | History—Eugene Trani |
| Child and Family—Michael Zunich | Home Economics Education—Anna Carol Fufts |
| Clothing and Textiles—Rose Padgett | Instructional Materials—Gordon Butts |
| College Student Personnel—Jack W. Graham | Inter-American Studies—Albert W. Bork |
| Community Development—Richard Thomas | Journalism—George C. Brown |
| Computer Science—A. M. Mark | Linguistics—James Redden |
| Design—Harry Perk | Mathematics—Carl E. Langenhop |
| Early Childhood Education—Rebecca Baker | Microbiology—Maurice Ogur, Hassan Rouhandeh |
| Economics—Charles Stalon, Milton Edelman | Molecular Science—John Zimmerman |
| Education—Functional Areas in the Ph.D. Program | Music—Roderick Gordon |
| Administration, Social & Philosophical Foundations—Fred Armistead | Occupational Education—Ronald W. Stadt |
| Educational Psychology—John Deichmann | Philosophy—Lewis E. Hahn |
| Curriculum and Instruction—Luther Bradfield | Physical Education (Men)—Edward J. Shea |
| Educational Administration and Foundations—Edward Sasse | Physical Education (Women)—JoAnne Thorpe |
| Elementary Education—Fred Sloan, Luther Bradfield | Physics—John Zimmerman |
| Engineering | Physiology—Florence Foote |
| Electrical and Systems Engineering—J. G. Smith | Plant Industries—J. K. Leasure |
| Engineering Mechanics and Materials—P. K. Davis | Psychology—Janet Rafferty |
| Thermal and Environmental Engineering—Juh-wah Chen | Recreation and Outdoor Education—Loren Taylor |
| English—Ted Boyle | Rehabilitation Administration—Robert E. Lee |
| English as a Foreign Language—Charles Parish | Rehabilitation Counseling—Brockman Shumacher |
| | Russian—Joseph Kupcek |
| | Secondary Education—R. J. Fligor |
| | Secretarial and Business Education—Harves Rahe |

Sociology—Charles Snyder, Peter Munch
Spanish—Lincoln Canfield
Special Education—James Crowner
Speech—Thomas Pace

Speech Pathology and Audiology—Herbert Koepp-Baker
Theater—Archibald McLeod
Zoology—DuWayne Englert

Grading System

Grades are recorded by the letters *A*, *B*, *C*, *D*, and *E* ($A = 5.00$). *A* is for outstanding work, *B* for good or average performance, *C* for conditional or not fully satisfactory work, *D* for unsatisfactory work, and *E* for failure. Other grades may be:

W—Authorized withdrawal made through a program change where no basis for evaluation has been established. Work may not be completed. This grade is not included in grade point computation for retention purposes.

WP—Authorized withdrawal made after first four weeks through a program change with a passing grade. Work may not be completed.

WE—Authorized withdrawal made through a program change after the first four weeks with failing grade. Work may not be completed, but grade is included in calculation of average.

INC—Incomplete. Has permission of instructor to be completed within a time period designated by instructor, but not to exceed one year from the close of quarter in which course was taken. If *Inc.* remains, it is not included in grade point computation. To complete the work, a student should not register for the course again but should complete the work from the original registration.

DEF—Deferred. Used only for graduate courses of an individual, continuing nature such as thesis or research. When the work is completed, grade is changed to a letter grade.

ABS—Unauthorized withdrawal. Used when student fails to continue in attendance, but does not withdraw through a program change. Counted as an *E* in calculating grade point average.

S—Satisfactory. Used for noncredit courses, thesis and dissertation hours.

U—Unsatisfactory. Used for noncredit courses, thesis and dissertation hours.

AU—Audit. A student registering for a course on an audit basis receives no letter grade and no credit hours. An auditor's registration card must be marked accordingly and he pays the same fees as though he were registering for credit. A student registering for a course for audit may change to a credit status or vice versa through the official program change method during the first four weeks of a quarter. Thereafter the change may not be made.

Note: Letter grades *A*, *B*, *C*, *D*, and *E* as well as the grades *WE* and *ABS* are included in grade point averages for academic retention. Authorized withdrawals made through a program change during the first four weeks of the quarter do not carry a grade. After four weeks it is at the discretion of the instructor whether or not a letter grade will be given for an authorized withdrawal.

2 / Instructional Units

Administration of Justice

The Center for the Study of Crime, Delinquency, and Corrections offers the Master of Science degree in administration of justice. This curriculum is a multidisciplinary study of crime, criminals, and societal responses to their behavior. Through merger of theoretical orientations and practical experience, students are prepared for careers in law enforcement, court administration and auxiliary services, correctional institutions, community-based programs, teaching in criminal justice curriculums, and criminal justice planning agencies. The projects and research activities of the center expose students to issues and settings of their subsequent careers.

Unconditional admission requires a 3.7 overall undergraduate average and acceptance by the center's faculty. Graduation requires writing of a thesis and completion of supervised field work. The sixty quarter hours of instruction include required core courses, supervised field work, and related courses. Students with undergraduate backgrounds particularly applicable to this curriculum may have the number of hours reduced to 52 quarter hours. Students with their advisory committees plan individualized multidisciplinary programs relevant to their academic and career objectives.

The center also supports joint graduate programs for students oriented primarily into the Departments of Government, Psychology, and Sociology. Inquiries may be addressed to the chairman of the center, Academic Affairs.

Agricultural Industries

The Department of Agricultural Industries offers graduate work leading to the Master of Science degree in agricultural economics, agricultural education, and agricultural services. Students interested in the Doctor of Philosophy degree in agricultural economics should consult with the Department of Economics. Students interested in the Specialist Certificate in agricultural education should consult with the Department of Secondary Education.

The three programs in the Department of Agricultural Industries leading to the Master of Science degree require at least 48 hours of graduate courses, including a thesis or research paper. Students normally take 12 hours of credit per quarter making it possible to complete the M.S. degree in one year. A committee composed of at least three professors guides the candidate in his course work and research. All candidates must satisfactorily pass an oral examination.

The M.S. degree in agricultural economics requires 20 hours of courses in agricultural economics and economics, 8 hours of statistics or advanced accounting, a thesis, and other courses normally selected in the School of Business. The program is designed for the professional agricultural economist and for those desiring to continue their education by obtaining a Ph.D.

The M.S. in agricultural education requires 26 hours of courses in agriculture and education, 8 hours of statistics, a research paper or thesis, and other courses. The program is designed for preparing teachers for secondary schools, junior colleges, and for those desiring to continue their education by obtaining a Ph.D.

The M.S. in agricultural services requires 18 hours of courses in agriculture, a research paper, and other courses. The program is designed to permit students who are working in agriculture in such areas as extension work and soil conservation employees, to expand their educational experiences in light of prospective employment goals and opportunities.

Application forms for admission into any of these programs may be obtained from the Graduate School. Inquiries for financial assistance should be addressed to the chairman of the department. Approval for graduate study in the department, with any necessary qualifications, is made after review of the student's transcript and other supportive data. Additional information may be obtained from the Department of Agricultural Industries, Southern Illinois University, Carbondale, Illinois 62901.

Animal Industries

The Department of Animal Industries offers programs of study leading to the Master of Science degree. Programs may be designed to meet the requirements of candidates in the various disciplines of animal behavior, breeding, nutrition, and physiology. Minimum requirements for the master's degree may be fulfilled by satisfactory completion of 48 quarter hours of graduate credit. If the student writes a thesis, 24 of these quarter hours must be in Animal Industries courses; if the student submits a research paper, 30 of these quarter hours must be in Animal Industries courses. A student who submits a research report and who has not completed at least 10 quarter hours of undergraduate course work in Animal Industries may be required, at the discretion of the Department, to take additional undergraduate or graduate courses. It is suggested that foundation courses in Animal Industries, such as An. Ind. 315, 332, 337, etc., be taken for credit as undergraduate electives by students majoring in other fields who contemplate graduate work within the department.

Research leading to a thesis can be conducted with beef cattle, dairy cattle, horses, poultry, sheep, or swine. Supporting courses may be selected in applied science, chemistry, mathematics, microbiology, physiology, zoology, behavioral sciences, etc.

Students who wish to emphasize the study of animal production in a program leading to the master of science degree might select a majority of their supporting courses from the Departments of Agricultural Industries or Plant Industries.

Students interested in animal science at the doctoral level can be admitted to a program of study leading to the Ph.D. degree in physiology.

The program which is administered by the Graduate School through the Department of Physiology is adequately flexible to allow candidates to emphasize such areas as behavioral science, endocrinology, meat science, metabolism, microbiology, physiological genetics, or reproductive physiology.

Minimum requirements have been established for students entering the Ph.D. program. These include undergraduate training in biology, inorganic and organic chemistry, and one year of both mathematics and physics. Deficiencies in these areas must be resolved prior to entry into the program.

Information concerning admission policies, requisites for graduation and availability of financial assistance for graduate study in any specific program can be obtained from the Department of Animal Industries, Southern Illinois University at Carbondale, Carbondale, Illinois 62901.

Anthropology

General Requirements

Acceptance for graduate study in anthropology and subsequent continuation in the graduate program are at the discretion of the Department of Anthropology.

Application forms for admission to the Graduate School may be obtained from the Graduate School. When submitting the completed application, the student must send official transcripts of undergraduate and graduate work; three letters of recommendation and a personal statement of aims and interests addressed to the chairman of the department must also be submitted.

Although Graduate Record Examination scores are no longer required by the department, the student is invited to include these scores with other data supplementing his application papers. The student is advised, however, that inclusion of such scores may be required as a part of a future application for nonuniversity grants or fellowships.

No special program of previous work is required, and applicants with academic degrees in fields other than anthropology are accepted. However, in consultation with the department, a plan for remedying undergraduate deficiencies in anthropology will be arranged.

The department does not require that every student take a master's degree on his way to the doctorate. Whether he does or not is a matter for decision by the student and the department. (For those who do not have the Master of Arts degree in anthropology, formal admission to the doctoral program is dependent on the degree of success of the student in the general examination.)

A student's overall progress in his studies is reviewed at the end of each year, or as may be necessary, in order to see that the requirements of the department are being met and that the student's best interests are being served.

Masters Degree Program (For students not seeking the Ph.D.)

For entering graduate students, in the M.A. program, the minimal GPA will be 4.0/5.0. While this GPA will serve as a general cutting line, exceptions may be made by the departmental Admissions and Awards Committee in view of such factors as an outstanding series of letters from

known references; graduates of recognized departmental programs; or intervening non-academic experience of an unusual nature. These factors are, in fact, already considered in assigning relative ranking in presenting rosters of students to the graduate school for awards and for similar purposes.

A foreign language competency must be demonstrated as determined by ETS scores, or otherwise in languages not included in the ETS foreign language program.

In the course of the student's training in the M.A. program, it is expected that there will be an experience as either a research assistant or teaching assistant, or both. This experience would hopefully amount to an academic year, but should be at least one quarter.

Forty-eight hours of course work, other than the thesis, are required. Half, or more, of this work must be at the 500-level, with all work completed with at least a minimal 4.0 GPA.

At the end of twenty-four hours (at least half at the 500-level), however, a student with a GPA of 4.25, or higher, may petition to take the general examination. If successful, he may by-pass his remaining M.A. work, thereby reducing his length of time on campus. In reality, the final twenty-four hours of M.A. work would count for the Ph.D. residency/credit requirements.

In completing his forty-eight hours of course work, the student is expected to obtain broad coverage within the field of anthropology. Specifically, he is expected to offer two courses in each of archaeology, ethnology, linguistics, and social anthropology. One course in each of history of anthropological thought and of physical anthropology should be included in his program.

The student may elect to write a thesis in which he is assigned a committee of two; or, he may present a research-oriented paper which has been accepted by an editor for publication. This writing and acceptance must have occurred subsequent to the student's entrance to this department. The evaluation of the paper would be by a committee of two, as in the case of the M.A. thesis. For a student who completes his general examination and is invited to proceed to the doctorate, a third alternative exists: a research paper approved by a committee of three, appointed by the chairman, may serve as the final M.A. requirement.

Under the first or second option listed above, the student would receive his M.A. degree following successful oral examination centered on the thesis or research paper.

Doctor of Philosophy Degree Program

For entering graduate students without the M.A., the minimal cut-off GPA is 4.0/5.0; for those entering with the M.A., it is 4.25/5.0. Exceptions can be made as in the M.A. Program.

Departmental Requirements

Normally, all graduate students in anthropology working for a higher degree must:

- a. Complete the course-hour requirements as established by the graduate school.
- b. Complete the equivalent of one or two academic years (3 or 6 quarters) of course work with not less than a *B* average before presenting themselves for their general examination. See *General Examination* below.

Previous graduate or professional work in anthropology may lead to the three-quarter qualification to take the general examination. The normal course load per quarter is four courses or approximately 12 hours; with assistantships this load is reduced.

c. Pass one foreign language examination before presenting themselves for their general examination, except for those taking the general examination at the first opportunity. Students are urged to investigate ETS foreign language examinations which may be taken prior to arrival at SIU, or at least be prepared to take this test in the first quarter of residence. The student is urged to acquire this language competence at the earliest opportunity so that he is equipped with a useful tool while pursuing his graduate studies.

d. Complete the following required course: Anthropology 415.

e. Satisfy all general University and graduate school requirements.

f. Pass with not less than a *B* average the general examination given in the fall and spring quarters. At the option of the department an oral examination may be required following the written examination.

The General Examination

The normal course of study leads a student to present himself for the general examination after two years of full-time course work. Students with M.A.'s in anthropology are required to take the general examination at the end of the first year of residence. All others are required to take this examination at the end of the second year. Any student may petition for examination before the deadline. For those prepared to take the general examination at the earliest opportunity, the prior passing of the first foreign language examination will be suspended.

The coverage expected of the student is stated in syllabi on the topics listed below. The length of the written examination is three hours for each part. Students may elect four of the six parts, satisfying the other two by an *A* or *B* grade in a graduate seminar in each of the parts omitted.

- | | |
|------------------------------------|-----------------------|
| Archaeology | Linguistics |
| Ethnology | Physical Anthropology |
| History of Anthropological Thought | Social Anthropology |

After fulfilling the seminar requirements, passing the general examination, and fulfilling departmental and University requirements, a student who wishes to take the M.A. degree will be advanced to M.A. candidacy and may fulfill the thesis requirement with any of the alternatives described for the M.A. program.

Students may go directly into the Ph.D. program at this point.

The Special Examination

A student preparing for the Doctor of Philosophy degree should plan not less than one academic year, or its equivalent, in residence after the successful completion of his general examination before presenting himself for his special examination. However, the student cannot take the special examination sooner than six months after completing his second foreign language requirement, or his alternative requirements in statistics or computer programming.

The field of study for the special examination is directed toward particular and concentrated study of a particular geographical area plus either two major topics or one major topic and a special topic. The field of study is determined after consultation with a special field adviser and

committee designated to guide the student's preparation for the special examination. The student's plan of special study will be presented at a colloquium for approval by this committee.

Study is currently invited or encouraged in the following areas and topics. Modifications will be considered as changes in faculty personnel and competencies warrant.

Areas

North America:

Greater Southwest

Eastern U.S. (East of Rockies)

Middle America:

Meso-America

Caribbean and Circum-Caribbean

South America:

Andean

Tropics

Pacific

Asia:

S.E. Asia

Africa:

West Africa

Europe:

Western Europe

Mediterranean Basin

Major Topics

Archaeology

Ethnology

Linguistics

Social Anthropology

Special Topics

Applied Anthropology

Art

Ecology

Ethnohistory

Folklore

The nature of the special field of study, its scope and limits, are determined in consultation with the department and delimited at the student's colloquium.

The normal expectancy is that the student's dissertation topic will be derived from his special field of concentration; however, in consultation with the department, exceptions may be made.

Field Research

A student ordinarily will not be recommended for the award of the Doctor of Philosophy degree unless he has had field research experience acceptable to his dissertation committee.

Ph.D. Candidacy

Students who wish to take a Doctor of Philosophy degree and who have met all the departmental requirements will be advanced to candidacy.

Dissertation

The candidate for the Doctor of Philosophy degree will consult with the department in order to select the topic for his dissertation. The chairman of his dissertation committee will then be appointed and, together with the committee, will advise the student accordingly.

Candidates for the Doctor of Philosophy degree must register for 36 hours of dissertation credit under Anthropology 600. Not more than 18 hours' credit can be earned in any one quarter.

Applied Science

Students may pursue a Master of Science degree with a major in ap-

plied science. Typical areas of study in applied science are materials science and nuclear science.

Acceptance for a degree program is made by the dean of the School of Engineering and Technology and subject to the admission requirements of the Graduate School. An applicant must have received a bachelor's degree with a major in engineering, engineering technology, physics, chemistry, or mathematics or with an emphasis in these fields.

Degree requirements are consistent with the general requirements of the Graduate School with a minimum of 48 hours of graduate credit required, including a thesis. A program of study will be developed by the advisory committee and the student. When the student has chosen a thesis topic and a staff member has consented to direct the project, the thesis director will become the student's adviser and will function as chairman of the advisory committee.

One-half or one-quarter time instructorships, teaching or research assistantships, and fellowships are available for qualified applicants. Additional information about programs, courses, instructorships, assistantships, and fellowships may be obtained from the dean of the School of Engineering and Technology.

Art

Graduate programs in art lead to the Master of Fine Arts degree in studio, offered within the College of Communication and Fine Arts, and to the Master of Science degree in art education, offered within the College of Education. The candidate is expected to select an area of specialization (studio or art education) around which his program will be planned in consultation with the major professor in that area.

Requirements for the Master of Fine Arts degree in studio (painting, sculpture, printmaking, drawing, ceramics, metalsmithing, and weaving) total 60 quarter hours. These hours are distributed as follows: 30 in major field, 12 in art history or related subjects, 5 to 9 thesis or terminal project work, and the remainder in electives. The candidate for the Master of Fine Arts degree must in addition to the completion of course work, present a terminal project, and participate in an oral examination. Residency requirement for this degree is a minimum of three academic quarters.

Requirements for the Master of Science degree in art education total a minimum of 48 quarter hours. These hours are distributed as follows: 16 in education; 32 to be elected from the areas of art education, art history, and studio; 5 to 9 quarter hours are to be devoted to either thesis work or research paper.

Undergraduate requirement for admission to the Master of Fine Arts program is a degree in art or art education; for admission to the Master of Science in Education, a degree in art education. Any exception to these requirements must be with the approval of the faculty in the special degree program, and with the consent of the director of the School of Art.

Asian Studies

A graduate minor is offered in Asian Studies which may be made up by selecting from the following courses which are listed by departments:

Agricultural Industries 417; Anthropology 401, 483, 585, Art 451a,b,c, 571, 572; Economics 460, 461, 462; Geography 466, 522; Government 457, 458a,b,c, 480, 521, 595; History 448, 449, 455, 510, 514; Philosophy 490, 591. Thesis and dissertations on Asian topics may also be written by students in any of several majors.

Interested graduate students may write to or consult with the chairman of the Committee on Asian Studies.

Biological Sciences

Requirements for Admission

1. Bachelor's degree with a major in a natural science department.
2. Admission to the Graduate School.
3. Approval of the chairman of the Biological Sciences Committee or his designated representative.

Requirements for the Master of Science Degree in Biological Sciences

Complete 60 hours of graduate courses in the biological sciences. The specific courses required of any student are to be determined by consultation between the student and the program committee, with the following provisions:

1. No more than 35 hours of credit in any one department may be used for the degree.
2. No minor area is required.
3. Have at least 24 hours of credit in 500-level courses. These may not include more than 4 hours for "special problems," 4 hours for "seminars," and 4 hours for "readings."
4. Complete at least one 400- or 500-level laboratory course in three of the departments of the biological sciences. (No special credit, such as indicated in 3 above, will satisfy this requirement.)
5. Submit a research paper.
6. Attend, for credit, at least one quarter of seminar in three of the departments of the biological sciences.

Advisement

Guidance of students shall be by a program committee of three members, one from each of the biological science departments involved, or other departments at the discretion of the program committee. The program director will serve as an *ex-officio* member.

Graduate work may be taken in the Departments of Botany, Microbiology, Physiology, and Zoology to obtain a Master of Science degree in biological science in the College of Liberal Arts and Sciences.

Additional information may be obtained from the director of the graduate biological program, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901.

Botany

Graduate work may be taken in the Department of Botany as a major

or minor leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees and as a part of the program in biological sciences leading to the Master of Science or the Master of Science in Education degree.

Applicants for the advanced degrees must be approved by the department. Queries concerning graduate work in botany should be made to the graduate adviser in botany. To be eligible for graduate work in botany, the student must have an equivalent to an undergraduate minor in botany. Certain deficiencies may be made up concurrently with graduate work.

In accordance with the general requirements of the Graduate School a candidate for the Master of Arts or Master of Science degree must complete 48 hours of graduate credit and a thesis. The Master of Arts candidate must demonstrate a competence in a foreign language.

The Doctor of Philosophy degree requires, in addition to a dissertation, a reading knowledge of two foreign languages or one foreign language and statistics or computer programming, if recommended by the candidate's committee.

Business Administration

The graduate faculty in business administration, consisting of members of the Departments of Accounting, Management, Marketing, and the Faculty of Finance of the School of Business at Carbondale, offers the Master of Business Administration degree. The M.B.A. program has as its objective the development of professional managers and executives to serve the needs of business and government and to prepare interested graduates for doctoral study. The program has been structured with flexibility so as to serve holders of baccalaureate degrees in business administration as well as those who hold degrees in other disciplines.

M.B.A. Admission Requirements

1. Complete all admission requirements set forth by the Graduate School.

2. Complete the Admission Test for Graduate Study in Business (Princeton Test) and have the results of the test mailed directly to the director of graduate programs in Business Administration. Information regarding this test is available by writing to: Admission Test for Graduate Study in Business, Educational Testing Service, Box 966, Princeton, New Jersey 08540.

3. Complete an interview with the director of graduate programs in Business Administration. This interview may be delayed in individual cases where a special trip to the campus would require travel in excess of one hundred miles to reach the Carbondale campus.

4. An undergraduate cumulative grade point average of 4.00 is preferred, and no less than 3.5 grade point average is permitted for admission. These averages are calculated on a 5.0 scale.

M.B.A. Degree Requirements

A minimum of 48 quarter hours of course work plus a terminal examination (oral, written, or both) are required. Candidates who receive permission to write a thesis must complete a minimum of 44 quarter hours

of course work plus an acceptable thesis for which 8 quarter hours of credit are assigned.

Candidates who lack the necessary prerequisites may be required to complete as much as 36 additional quarter hours of acceptable course work. Those who enter the Master of Business Administration program with deficiencies in any of the basic areas in the common body of knowledge in business and administration as specified by the American Association of Collegiate Schools of Business must eliminate the deficiencies in a satisfactory manner prior to starting the program course work.

The Master of Business Administration program course work to be taken beyond that needed to eliminate deficiencies is determined on an individual basis in conference with the director of graduate programs in business administration. Candidates must satisfy requirements in the following areas: quantitative methods, accounting, economics, behavioral sciences, legal environment of business, finance, marketing, management, communication, and business policy.

The candidate may select a concentration, not to exceed 24 quarter hours of credit in accounting or 16 quarter hours of credit in finance, or management (personnel or production) of marketing. The candidate may also choose courses in a wide variety of areas of graduate study throughout Southern Illinois University.

Chemistry and Biochemistry

Graduate courses of study leading to the Doctor of Philosophy and Master of Science degrees are offered by the Department of Chemistry and Biochemistry. Interested students should consult the chairman of the department for a complete statement of the requirements for each degree. The following is a summary of these requirements.

Master of Science Degree

In addition to meeting the general requirements of the Graduate School, a candidate for the Master of Science degree in chemistry is required to:

1. Pass field examinations in 3 of the 5 fields (analytical, inorganic, organic, physical, and biochemistry) of chemistry or complete their equivalent in course work with a grade of *B* within the first six quarters of residence.

2. Earn 9 credit hours at the 500 level in one of the five basic fields of chemistry (Chemistry 451a,b,c may be taken in place of two 500 level biochemistry courses) and earn credit in one chemistry course at the 500 level in each of two other fields.

3. Earn 40 hours credit in chemistry courses, or 30 hours in chemistry if an outside minor is elected. A total of 48 quarter hours is needed for graduation of which 24 hours must be at the 500-level.

4. Maintain a 4.00 grade-point average.

5. Attend weekly seminars and earn one hour credit (Chemistry 595) by presentation of a seminar.

6. Earn a minimum of 12 hours in research and thesis (Chemistry 598 and 599).

7. Demonstrate reading competence in one of the following languages: German, Russian, or French.

8. Prepare and present a thesis on the research carried out.

9. Pass a final oral examination.

Doctor of Philosophy Degree

Students entering the Ph.D. program either must have a master's degree in chemistry or must meet all of the requirements of the Graduate School and of the Department of Chemistry and Biochemistry for the master's degree except for the thesis and oral examination requirements which may be omitted. In addition, all students in the Ph.D. program must:

1. Fulfill proficiency requirements in physical chemistry and three of the other four fields (analytical, inorganic, organic and biochemistry) of chemistry or complete their equivalent in course work with a minimum grade of *B* within six quarters of residence, exclusive of summer quarters.

Students fulfilling the proficiency requirements in only 3 fields within the specified period may continue toward the M.S. degree. On successful completion of all the requirements for the latter degree, including thesis and final oral examination, they may petition the department requesting permission and conditions for continuing work toward the Ph.D. The department, acting as a committee of the whole, will rule on such petitions on due consideration of the recommendation of the candidate's Graduate Committee and all other pertinent information.

2. Complete a course of study as determined by his graduate committee.

3. Earn one hour credit in seminar (Chemistry 595) beyond the Master of Science degree requirement and attend weekly seminars.

4. Earn a minimum of 48 hours in research and dissertation (Chemistry 598 and 600).

5. Pass cumulative examinations.

- a. After having fulfilled all the proficiency requirements, a candidate may begin taking cumulative examinations. A graduate student holding a master's degree in chemistry may proceed with the cumulative examinations in those areas in which he has fulfilled the field examination requirements.

- b. A student may elect to take cumulative examinations in his major area only, or he may elect to take cumulative examinations in different areas. If the student elects the latter course of action, he must so inform the chemistry department graduate advisers at the time that he selects director of his intention to pursue a cross-area curriculum. It is the responsibility of the student's graduate committee to determine how the cumulative examinations are to be divided among the several areas. However, in no case can the total cumulative examination requirement be less than stipulated below.

- c. Ten examinations are to be given each calendar year with two examinations respectively in the fall and summer quarters and three examinations respectively winter and spring quarters. Cumulative examinations may be written examinations not to exceed two hours in length. Take-home examination, laboratory examinations, or oral examinations may be substituted for a written examination. All areas will give their examination simultaneously. The time and place for the examination will be posted at least ten days before an examination. The subject of an examination may be announced in advance of the examination. A student must register to take the examination at least one week before it is scheduled.

- d. A student must pass 5 examinations in no more than 14 trials in order to continue for the Ph.D. degree. *A student must take consecutive examinations.* He is urged to begin as soon as he is eligible.

He is not liable for examinations during any time he is not enrolled in school.

6. Pass preliminary oral examination following completion of the Cumulative Examination requirement and the research tool requirement.

7. Maintain a 4.25 grade-point average.

8. Demonstrate competence in one of the following languages if this requirement was not fulfilled during previous graduate studies: German, French, or Russian. This requirement must be fulfilled prior to scheduling the preliminary oral examination.

9. Complete his dissertation following the specifications set forth by the Graduate School.

10. Schedule and pass a final oral examination (defense of dissertation). Copies of the dissertation must be distributed to the members of the graduate committee at least one week prior to the examination.

Community Development

The Community Development Institute offers an inter-disciplinary Master of Science degree in community development consisting of 48 credit hours, a field internship, and the completion of one of four terminal options. Within this degree program, and depending upon his professional plans, the master's candidate is able to minor in one discipline; such as, agriculture, anthropology, economics, education, geography, government, history, psychology, or sociology; or to pursue a multi-disciplinary minor in such areas of concentration as urban studies, planning, group work, or international development. To be admitted, a student must meet the requirements of the graduate school and also complete the following courses or their equivalent at either the graduate or undergraduate level:

CD 401, Introduction to Community Development 4 hours

Social Statistics 3-4 hours

An introductory and one other course in sociology 6-8 hours

In certain circumstances, the above prerequisites may be completed after admission to the major.

The specific requirements of the community development Master of Science degree program include the following:

1. Courses designed or approved by the Community Development Institute, including one of four alternative terminal options (master's thesis, terminal research paper, extended minor, or master's project), totaling 28 hours: CD 501, 502, 503, 511, 598, and 596 or 599.

2. Work in one or more allied fields, such as those mentioned as minors above, totalling 20 hours.

3. Up to one year of supervised part-time field work in community development (approximately 400 clock hours.)

4. Satisfactory completion of a terminal oral examination at which the master's candidate defends work done in his terminal option as well as his knowledge of the field of community development.

Computer Science

The Department of Computer Science offers a graduate program leading to the Master of Science degree.

Application forms for admission to the computer science program should

be obtained from the Graduate School. The decision on admission to the program is made by the department faculty subject to the requirements of the Graduate School. An undergraduate major in computer science is not required for admission and students with majors in other fields are accepted if certain criteria are satisfied.

Requirements for the master's degree include a minimum of 48 hours of graduate credit with credit for a thesis or research paper included in this total. The specific number of credits required depends in part on the nature of the student's undergraduate training. The student's individual program of study will be jointly developed by the student and the graduate adviser of the department.

Specific information concerning admission and degree requirements, assistantships and fellowships may be obtained by writing to the chairman of the Department of Computer Science.

Conservation and Outdoor Education

The Department of Conservation and Outdoor Education in cooperation with the Department of Recreation handles the interdisciplinary, inter-departmental program of study leading to the Master of Science in Education degree. The curriculum is designed to prepare professional leadership for the supervision, management, and administration of outdoor education. See Department of Recreation for further information.

Design

The Department of Design attempts a generalized rather than a specialized design education. Through his undergraduate years the student is led to treat man and his environmental transactions in terms of whole systems rather than of isolated aspects or component parts. Emphasis is placed on the overall solutions to human problems which may be encompassed through design procedures.

The graduate program of the department continues this broad integrative approach but assumes that, at this level, the student should concentrate his studies in a more closely defined area within which he should work in depth.

It is recognized, however, within the present massive accelerations in the design possibilities of man's control over his environment, that the format of such graduate study should offer the utmost flexibility and capacity for change. The entire graduate program should be viewed as experimental in nature and one whose content and approach will be adjusted according to experience and field developments.

Students with an undergraduate background in various areas of design specialization may qualify for the master's degree program. In addition, on the premise that the association of diverse disciplines participating in the design process may often yield productive and enriching interactions, students with an undergraduate background in fields other than design will be accommodated. Special arrangements should be developed in consultation with the chairman of the department.

Students applying to the department must submit a letter explaining their background, their reasons for selecting this program, and their major goals; and examples of work that they have produced to the head of the

graduate program. A faculty committee will review the letter and work and when possible have a personal interview with the applicant to evaluate his acceptance into the department.

The two-year program leading to a Master of Science degree requires at least 34 hours of graduate study in the Department of Design; at least 18 hours of study outside the department; and 9 hours of thesis. Within the structure of this program, the students will work as an operational research organization and through individual studies. There will also be the opportunity to participate in seminars and lectures given by distinguished visiting professors. The faculty are interdisciplinary representing the fields of design, systems analysis, social psychology, and computer science.

Economics

General Information

Graduate courses in economics may be taken as a major or minor leading to the Master of Arts, Master of Science, or Doctor of Philosophy degrees. In addition to Graduate School admission standards, the Department of Economics requires completion of the verbal, quantitative, and advanced economics portions of the Graduate Record Examination except where it may create a hardship for international students.

Master's Degrees

Either the M.A. or M.S. degree requires successful completion of 48 hours of graduate work including thesis and an oral examination. The M.A. degree also requires demonstration of proficiency in one of the foreign languages required for the Ph.D. degree at the level prescribed for that degree. Each master's degree candidate must complete at least 33 hours in economics, including courses in economic statistics, mathematical economics, monetary theory and policy, micro and macro economic theory and thesis. If the student intends to enter the doctoral program he should, in addition, take the remaining courses included in the doctoral core which would add history of economic thought, comparative economic systems, and advanced work in micro and macro economic theory. Before undertaking work in mathematical economics and economic theory the student should have completed at least ten quarter hours in calculus or linear algebra.

Doctor of Philosophy Degree

The Ph.D. prepares the student for teaching and research positions in the academic world, for positions as economist in private industry, for positions with private research or consulting organizations, or for government positions requiring advanced economic training.

The degree is awarded for high accomplishment as evidenced by these steps:

1. Demonstrating proficiency in statistics as a research tool through successful completion (minimum grade of *B*) of Mathematics 410a,b, and c or d; or Mathematics 480a,b,c; or Mathematics 483a,b,c. Econometrics 567a may be substituted for Mathematics 410 c or d.

2. Demonstrating proficiency in a second research tool chosen, with the prior consent of the director of graduate studies, from one of the following:

a. A foreign language. Proficiency is demonstrated by successful completion of the Educational Testing Service Examination or by passing Foreign Languages 288a,b,c with a grade of *A* or *B* in each course.

b. Mathematics. Completion of the second year calculus sequence, plus one additional course at the 400 level or one 300 level course selected from Mathematics 301, 305a, 321, 352, 319. Each course must be passed with a grade of *B* or better.

c. Any three courses at the 400 or 500 level in an area other than mathematics that is closely related to economics and each passed with a grade of *B* or better.

d. Computer programming. The student should consult the director of graduate studies for the method of demonstrating proficiency.

3. Completing required courses in history of economic thought, mathematical economics, comparative economic systems, monetary theory and policy, and micro and macro economic theory.

4. Passing a written qualifying examination in economic theory and mathematical economics.

5. Passing written and oral preliminary examinations in three specialized areas chosen, with the prior consent of the director of graduate studies, from comparative economic systems, economic development, economic history, economic theory (two fields are available), econometrics, human resources, international economics, money and banking, political economy, public finance, or any graduate area outside economics but having a reasonable connection with economics.

The student is admitted to candidacy for the degree after he passes the preliminary examination.

6. Completion of a dissertation based on original research and successful defense of the dissertation before a faculty committee.

More detailed descriptions of the graduate programs, as well as information on teaching and research assistantships and fellowships may be obtained from the director of graduate studies, Department of Economics.

Education

One may pursue a program of study leading to the Doctor of Philosophy degree in education through any one of three functional areas: curriculum and instruction; educational psychology; administration and social and philosophical foundations. Specialties are available within the functional areas depending upon the student's interests. For example, in educational psychology he may choose a specialty in human learning, educational measurement and statistics, learning resources, special education, or counseling and guidance. In all programs, students must satisfy the general requirements of the Graduate School in addition to the special requirements for the Doctor of Philosophy degree in education.

Application

An applicant must submit, to the coordinator of the functional area in which he wishes to do his work, his scores from the Graduate Record Examination and the Miller Analogies test, and other pertinent data. Following review by the area's screening committee, the coordinator will inform him of the committee's decision.

Advisement

For each student, the coordinator of his functional area appoints a program committee consisting of a chairman, who is in the student's functional area and who is authorized to direct doctoral dissertations, and two other members, at least one of whom must be from outside the student's functional area. His program, planned to include all of his graduate study beyond the master's degree, should be approved at a meeting of the student with his committee. Copies of the approved program are filed with the members of the committee, the student, the area coordinator, and the assistant dean for graduate studies. Appropriate program changes must be approved and filed in the same manner.

Program Requirements

Each doctoral student in education must successfully complete a prescribed core of 12 credits in psychological foundations of education and social and philosophical foundations of education combined. In a functional area certain basic courses may be required beyond the common core. Specialties within the functional areas are supported by specific courses and other experiences agreed upon by the student and his program committee.

Research Tool Requirements

A. ADMINISTRATION AND SOCIAL AND PHILOSOPHICAL FOUNDATIONS

The faculty of the Functional Area of Administration and Social and Philosophical Foundations recognizes the research orientation for the Doctor of Philosophy degree. It further recognizes that the multiplicity of educational programs in the Functional Area demands varying competencies in research. For this reason, no common research tool will be required of all students. Specific research tool competencies and procedures for evaluation shall be determined by the program committee of each applicant congruent with the professional preparation and goal expectations of the student and the requirements of the student's concentration.

B. CURRICULUM AND INSTRUCTION

Each candidate for the Doctor of Philosophy degree shall be required to demonstrate competence in a minimum of one research tool chosen by his program committee from a list approved by the area of Curriculum and Instruction. The tool or tools shall embody skills needed in understanding materials in the fields, or in the conduct of research for the dissertation, or in continuing research contributions in the field of specialization. Approved research tools include foreign languages (one language is one research tool), statistics, and computer programming. Proficiency examinations are required for languages and computer programming, and may be used for statistics. If courses are taken to satisfy any research tool requirement, those courses will not count toward the minimum credit requirement for the degree. A student whose native language is other than English may not offer English as one language, and will demonstrate his proficiency in his course work. The student's native language is not acceptable as a research tool. The research tool

requirement must be satisfied before the student may take the preliminary examination.

Proficiency in foreign languages will be determined by means of the Educational Testing Service's graduate foreign language examinations, administered by the Counseling and Testing Center once each quarter. The ETS examinations are available only in French, German, Russian, and Spanish. A student who wishes to present any other language must have his program committee recommend to the dean of the Graduate School this particular language as necessary in dissertation research. The dean must approve the recommendation before arrangements for testing in that language can be made with the Department of Foreign Languages or any other testing service.

If a student fails an examination in a particular language twice, he will be required to take the course 161 in that language before taking the examination again. After a third failure of the doctoral examination in the same language, the student must successfully petition the dean of the graduate school before taking the examination a fourth time.

A student whose advisory committee chooses statistics as a research tool may demonstrate proficiency by passing a sequence of courses in statistics (Guidance 505, 506, 507; Mathematics 410a,b,c or d; 480a,b,c; or 483a,b,c) with a grade of *B* or better in each of the three courses. If the student has some background in statistics and the approval of his advisory committee, he may meet this requirement by skipping the first course and taking the second and third, in which he must earn a *B* or better. Or, if his background is thought adequate by his committee, he may take a proficiency examination equivalent to the final examination in all three courses of a given sequence, with that exam to be administered by the instructor of that sequence, and on which the student must make a grade of *B* or better.

The student for whom the computer programming option is chosen will demonstrate that he can competently use two programming languages, ALGOL and FORTRAN. He will be required to pass a written examination, and then to demonstrate that he has developed some sophisticated skill in the use of the computer languages by writing programs to accomplish specified tasks. Any courses taken to help achieve the necessary skills cannot be used for credit toward a Ph.D. degree.

C. EDUCATIONAL PSYCHOLOGY

A research degree in the educational psychology functional area requires competencies of all students in statistics, learning, and development and personality. These competencies are attested by examination.

No specific research tool will be required for all students. Competencies which facilitate specific research skills will be determined by the candidate's program committee.

Preliminary Examinations

When a student has passed the research-tools requirement and completed at least 36 hours beyond a master's degree or its equivalent, he may apply to the College of Education for permission to take the preliminary examination. The preliminary examination will assess the student's competencies in his field of specialization, including the research findings and techniques necessary for scholarship and productive work in his field.

Dissertation

The dissertation committee consists of a chairman who is authorized to direct doctoral dissertations and at least three others who are authorized to serve on dissertation committees. The committee is appointed by the dean of the Graduate School on the recommendation of the area's coordinator through the assistant dean. At least one member of the committee must be from a functional area other than that of the student and at least one must be from a related area other than professional education.

Satisfactory completion of the dissertation requirement includes the passing of an oral examination which covers the dissertation and related areas.

Educational Administration and Foundations

This department carries extensive graduate offerings in educational administration, instructional supervision, and educational foundations in support of the Master of Science in Education degree, the Sixth-Year Specialist's Certificate, and the Doctor of Philosophy degree in education.

The department administers its programs leading to the master's degree and the Sixth-Year Specialist's certificate, and provides programs and personnel for doctoral students who wish to specialize in educational administration, general instructional supervision, and educational foundations.

Master of Science in Education

At the master's level, majors are offered in educational administration and in instructional supervision. Graduate courses taken in the department must follow the pattern of prerequisites for admission to courses. Admission to master's degree work in the department must be approved by the departmental admissions committee. The admissions requirements are available upon request to the chairman. Degree candidates' programs of courses must be approved by the appropriate adviser in the department. Transfer from unclassified status will conform to Graduate School and departmental requirements for such transfer.

The program for the Master of Science in Education degree, with a major in educational administration includes a basic core, an educational foundations sequence, research and tool subjects, and selected specialized courses. A research paper and a comprehensive oral examination are also required. The department stresses the advantage of an academic field teaching major for all educational administration students. An applicant with aspirations for public school practice is expected to have two years of successful teaching experience and must be able to meet the general administrative certification requirements of his respective state before the master's degree is conferred.

The regulations for the master's degree, with a major in instructional supervision, parallel those for the degree in educational administration. Students in this area normally select specialized courses in supervision and curriculum appropriate to their goals as supervisors, (i.e. elementary, secondary or both). The department encourages a cross-departmental approach in the selection of appropriate courses for individual programs.

Sixth-Year Specialist's Certificate

Admission standards for the Sixth-Year Specialist's certificate program parallel the admission requirements for the Doctor of Philosophy degree program. All candidates must have the master's degree or its equivalent. Prerequisites to this program include the required courses for the Master of Science in Education degree in educational administration which are not included in the student's master's degree program.

At least 8 hours in graduate courses will be taken in foundation fields of educational administration, at least 16 hours in the area of administrative specialization, at least 8 hours either in an internship or practicum, and five hours in a field study.

The Sixth-Year Specialist's certificate program will be designed by the candidate and his adviser subject to the approval of the student's advisory committee. Specific courses and the sequence in which they are to be taken must be approved by the advisory committee. The department requires a comprehensive written examination as the final step toward the sixth-year program.

Doctor of Philosophy

The Department of Educational Administration and Foundations participates in the doctoral program in education in the functional area of Administration and Social and Philosophical Foundations. Students interested in educational administration and in social and philosophical foundations may pursue an equivalent of a major within the area program. For additional information on the Ph.D. in Education see the preceding section above. Inquiries should be addressed to the coordinator, area of Administration and Social and Philosophical Foundations in the College of Education.

Elementary Education

General Information

Graduate programs in the Department of Elementary Education lead to the Master of Science in Education degree and the specialist's certificate, and contribute to the Doctor of Philosophy degree program in education.

Each graduate program includes certain required courses, guided electives, and related courses from areas other than elementary education. All programs must be planned with and approved by the graduate advisers in elementary education or in early childhood education. Specific course requirements for a given program may be obtained upon request from the Department of Elementary Education, Wham 222, Southern Illinois University, Carbondale, Illinois 62901.

Unclassified students who are working on certification requirements are encouraged to change their status to that of candidate for the Master of Science in Education degree. Students who elect to remain unclassified must have the written approval of the chairman of the Department of Elementary Education before taking the professional courses offered by the department.

The Master's Degree

Each graduate major in elementary education and in early childhood

education for the Master of Science in Education degree consists of a minimum of 48 hours at least 24 of which must be on the 500 level. Programs have been developed to serve a variety of specialties in the field of elementary education as well as a program in general elementary education. The specialties which a student may choose are: social studies, language arts, developmental reading, clinical reading, mathematics, science, and early childhood education. Courses are also offered which support the program in elementary school administration and supervision, although students seeking certification or a degree in this field may major in the Department of Educational Administration and Foundations or the Department of Elementary Education. The assistant dean for graduate studies in the College of Education will be the recommending officer for administrative or supervisory certification. In lieu of a thesis, students are required to write a research paper and take Guidance 422a or its equivalent and Educational Administration and Foundations 500.

A total of from 8 to 12 hours should be selected from departments outside the College of Education.

Those who have undergraduate degrees in other fields, regardless of teaching experience, are required to complete, without graduate credit, at least four hours of elementary methods and eight hours of elementary student teaching. The teaching must be done in residence at a university or college approved by the National Council for Accreditation of Teacher Education. Admission for these students is conditional and the degree will not be conferred until Illinois teaching certificate requirements have been met.

A comprehensive examination in the area of general elementary education must be successfully completed by each student in elementary education or early childhood education. An examination may be given in the area of specialization as determined by the faculty associated with that specialty.

Any student taking graduate courses without first being approved by his adviser risks having work not accepted for the degree.

The Sixth-Year Specialist's Certificate

The Sixth-Year Specialist's Certificate program requires 45 hours beyond the master's degree. The program is individually planned to meet the student's professional objectives. Part of the program includes a project which shows the ability to conduct individual investigation. Additional information can be obtained by writing to the address indicated above. These inquiries should be addressed to the chairman of the department.

The Doctor's Degree

The Department of Elementary Education participates in the Doctor of Philosophy degree in education with a major in curriculum and instruction with emphasis in elementary education. The applicant is approved only after admission to the curriculum and instruction functional area. Research requirements of the area must be met. Required also are completion of the preliminary examination in the field of specialization and the dissertation. The program has certain core requirements but is individually planned to meet the professional needs of the student. Opportunities are available for a strong subject-matter minor if one is interested, for instance in a special subject-matter field in the elementary school. Write

to the chairman of the Department of Elementary Education for detailed requirements.

Engineering

Graduate programs leading to a Master of Science degree with a major in engineering are available in three engineering departments. Course offerings and research activities within the departments include:

Department of Electrical Sciences and Systems Engineering:

circuits, electronics, electromagnetics, energy conversion, bioengineering, systems analysis and design, controls, instrumentation, and operations research.

Department of Engineering Mechanics and Materials:

viscous and inviscous flow, compressible flow, turbulence, wave motion, numerical fluid dynamics and solid mechanics, continuum mechanics, experimental stress analysis, stability, photoelasticity, structural analysis and design.

Department of Thermal and Environmental Engineering:

air-pollution control, water-quality control, thermal pollution, mass and heat transfer, thermodynamics, chemical processes.

Students who are interested in graduate studies in engineering must be admitted to the Graduate School and accepted in the degree-program by one of the three engineering departments. An applicant must have a bachelor's degree with a major in engineering, mathematics, physical science, or life science with competence in mathematics.

Degree requirements are consistent with the general requirements of the Graduate School with a minimum of forty-eight hours in graduate credits, including thesis credit. Students whose undergraduate training is deficient may be required by the department to take coursework without graduate credit.

A program of study will be developed by a graduate adviser and the student. Each student is required to concentrate in one of the branches of engineering, but with the approval of his graduate committee, may also take courses in other branches of engineering or areas of science and business such as physics, geology, chemistry, mathematics, life science, or management.

Teaching or research assistantships and fellowships are available for qualified applicants. Additional information about programs, courses, assistantships, and fellowships may be obtained from the School of Engineering and Technology or any one of the three engineering departments.

English

Graduate courses in English may be taken for a major or minor in the Master of Arts program, for the subject-matter major in the Master of Science in Education program, and for the Doctor of Philosophy degree. In addition to Graduate School requirements for admission to the Doctor of Philosophy program, the Department of English requires a score at the 70th percentile or above in the advanced section of the Graduate Record Examination. Inquiries about admission to graduate study in English should be sent to the Director of Graduate Studies in English, Depart-

ment of English, Southern Illinois University, Carbondale, Illinois 62901.

For the Master of Arts degree in English, the student must satisfy the following requirements:

1. Complete at least 48 hours of satisfactory graduate work.
2. Take English 500 in the first term it is available to him.
3. Take a course in the English Language or in linguistics.
4. Take English 585 (required only of teaching assistants).
5. Demonstrate competence in one foreign language, normally French or German. This requirement will be regarded as satisfied if the student has taken two years of college-level foreign language, or its equivalent, with not less than a *B* average for the two years of work. Otherwise, the requirement must be satisfied by examination, which must be arranged through the director of graduate studies.
6. Submit to the director a clean copy of that research paper which best represents his abilities and accomplishments.
7. Pass the master's comprehensive examination.

The Master of Science in Education with an emphasis in English is administered by the Department of Secondary Education. 32 of the 48 hours must be English credit, as advised by an English education specialist in the Department of English.

For the Doctor of Philosophy degree in English, the student must satisfy the following requirements:

1. If he has not already taken such courses on the graduate level, take at least one course in each of the following fields: English literature to 1500, 1500–1660, 1660–1800, 1790–1900, 1885 to date, and American literature.
2. If he has never had courses, graduate or undergraduate, in Chaucer, Shakespeare, and Milton, remedy this deficiency.
3. Present evidence of competence in English language and linguistics, normally by completing the appropriate courses with a grade not lower than *B*.
4. Satisfy two research-tool requirements. (See below.)
5. Pass preliminary examinations in English and American literature, the preparation for which is prescribed by his advisory committee.
6. Submit a satisfactory dissertation.
7. Pass a final oral examination.

Research tool options

A student may satisfy the research tool requirements by fulfilling one of the three options listed below. The choice of option and languages selected must be approved by the student's advisory committee.

1. A reading knowledge, demonstrated by examination, of two languages in addition to English, selected from any language in which there is substantial literature for research and which is germane to the student's field. Foreign students may specify their native language as one of the foreign languages, provided it is one which meets the above requirements.
2. A command of one foreign language and its literature demonstrated by examination or by at least three courses numbered 400 or above, with an average grade not lower than 4.0. Preparation for this examination

normally would require the equivalent of three years of study at the college level with grades of *B* or better. Foreign students may use their native language, provided it is one which is germane to the particular field of major concentration.

3. A student may elect to offer a single foreign language, and a special research technique or collateral field of knowledge. A special research technique should represent the acquisition of any special skill that will effectively contribute to the research proficiency of the student (provided that such a skill is not an assumed or traditional part of the major). The collateral field of knowledge is expected to broaden the student's scholarly background by permitting exploration of knowledge in a field related to the major.

To satisfy the research technique or collateral field requirement, the student may complete a total of three courses numbered 400 or above, with an average grade not lower than 4.0.

Foreign Languages

For the Master of Arts and Master of Science in Education degrees, major and minor are offered in French, German, and Spanish. A minor may be taken in Russian.

For the Master of Science in Education degree, Romance Philology 410 is required for students in French and Spanish, and for those in German, German 413 is required. For the Master of Arts degree in French and Spanish, Romance Philology 410 and three hours of either French or Spanish 515 are required. All romance philology courses may be counted toward either French or Spanish specializations. For the Master of Arts in German, German 413 and 533 are required.

Normally the bachelor's degree and a minimum of 27 hours in courses on the junior-senior level, or the equivalent, constitute the prerequisite for registration in graduate courses. However, students who do not meet this requirement may register for specific graduate courses with the consent of the instructor and the authorization of either the chairman of the department or the chairman of the graduate committee of the department.

Forestry

The Department of Forestry offers advanced courses for the Master of Science degree. Collateral course work in other departments of the University is recommended but varies with a student's specific program. The major forestry disciplines emphasized are: forest recreation and park management; forest resource economics; wood science and forest products; silviculture; tree breeding and improvement; forest biometrics; and forest watershed management. Also at the master's level a more diverse program in outdoor recreation resource management is offered to students with or without forestry undergraduate training. This program includes a basic core composed of Management 440; Recreation 500; Forestry 450; Forestry 451a,b; Forestry 575. The remainder of the course work consists of selected electives which enable the student to combine his earlier academic experiences with a concentration in economic, natural, or social resources at the outdoor recreation resources management level.

In addition, cooperative curricula are available which permit graduate forestry students to enroll in Doctor of Philosophy programs with other departments. Syllabi are arranged on an individual student basis, emphasizing an interdisciplinary approach, and orienting within the biological, physical, or social sciences.

All candidates for the Master of Science degree will be expected to complete original research in some field related to forestry or outdoor recreation resources. For those concentrating in forestry this research shall lead to the completion of a thesis which will be governed by the rules of the Graduate School. Students in the outdoor recreation resource management program may elect either a thesis problem or a research problem. Competence in a foreign language is desirable but not required. The same number of minimum hours required by the Graduate School are acceptable to the Department of Forestry. Three letters of recommendation are requested in support of each candidate before he is accepted for graduate study. Submission of a 1,000-word theme prior to acceptance is required in addition to the completion of the aptitude test of the Graduate Record Examination. Further, a potential student must complete a "Statement of Interest" form that guarantees the sponsorship of a major professor. This form and additional details can be obtained by writing the Department of Forestry.

Geography

The Department of Geography offers three fields of specialization: physical environmental systems, resource management systems, and systems of cultural adaptation. Programs lead to the degrees of Master of Arts, Master of Science, and Doctor of Philosophy. Also offered is a concentration in geography as a part of the Master of Science in Education program in secondary education.

Master's Degree

The graduate program for each student will be structured from a student-inquiry viewpoint. The student should take the initiative with the guidance of his adviser and the departmental faculty during all phases of his program.

Selection of a Tentative Adviser

Students admitted to the master's degree program should expect to qualify for the M.A., M.S., or M.S. in Education degree, normally within a 24-month period. Incoming students should choose a tentative adviser no later than two weeks after the beginning of their first quarter of residence. The choice will be made in consultation with the chairman of the department and with the consent of the prospective adviser taking into consideration such matters as faculty expertise and faculty and advisee loads.

Course of Study

A proposed course of study, identifying deficiencies to be rectified, and language, statistics, or other technique requirements, will be initiated by the student in consultation with his adviser during the student's first quarter in residence. The proposal will be presented to the graduate research program and professional activities committee of the department for its comment, and subsequent approval. The proposed course of study

shall include the following courses: Geography 450, 451, 452, and 550. Each student will also include 3 seminars in his program.

Proficiency Option

Each student will enroll in Geography 450, 451, 452, and 550 during the first quarter of its offering after his matriculation. A proficiency examination for each of the three core courses will be offered upon request to each student before the end of the first week of the quarter of its offering. Notification of the student's passing or failing of the proficiency examination will be given to the student within one week after the examination.

Review and Evaluation of Student Progress

Each student's progress will be assessed quarterly by the faculty in a meeting within 10 days after the beginning of the ensuing quarter. For that meeting, a written statement, based on faculty reports of his performance will be generated by the adviser for submission to the student, the chairman of the department and the graduate research program, and professional activities committee. Each student is expected to show continued progress and in particular, to develop habits of critical analysis and dialogue. Unsatisfactory progress will be brought to the attention of the graduate research program and professional activities committee for recommended action by the faculty.

Master's Advisory Committee

Students have two options for the master's degree: a thesis or a research paper. This option must be decided before the end of the third quarter of residence.

Before the end of the third quarter of the student's program, an adviser and committee must be arranged and approved by the faculty; the committee must implement the following at that time:

1. Circulate the student's preliminary research paper or thesis proposal to the faculty for comment and recommendation to the master's advisory committee where approval must be obtained prior to the student's registration for thesis hour credit.

2. Arrange for the student's accomplishment of an assigned field problem which must be completed in a prescribed length of time. Successful completion includes an oral defense of the faculty of the student's methodology and findings.

3. Provide for a faculty evaluation of the student's performance in the areas described above and decide whether the student is to be encouraged to continue with second year of graduate study. Tentative course enrollment projections for the second year should be approved at this time.

Completion of Requirements

The finished thesis or research paper will be submitted to the master's advisory committee for approval. The judgment of the committee will be expressed to the student and forwarded to the chairman for recommendation to the Graduate School for the conferring of the master's degree.

Doctor of Philosophy Degree

The Ph.D. degree is a specialized research degree. Although it assumes a broad background comparable to that provided by the M.A. program the Ph.D. program is designed to develop a comprehensive yet a critically

analytic knowledge of theory, literature, research, design, and application within one of the three fields of specialization. In addition the Ph.D. candidate will concentrate in two subfields in which he proposes creative research.

Program

The student and his tentative adviser will formulate a program which will include the following courses: Geography 450, 451, 452, and 550. The student, adviser, and committee will ascertain the tools and cognate courses appropriate and will certify proficiency. Each student will include four research seminars in his program.

Before the end of the second quarter of doctoral work, the student will select an adviser and they jointly will recommend doctoral committee members to the graduate faculty for certification.

Review and Evaluation of Student Progress

Each student's progress will be assessed quarterly by the faculty in a meeting within 10 days after the beginning of the ensuing quarter. For that meeting, a written statement, based on faculty reports of his performance will be generated by the adviser for submission to the student, the chairman of the department and the graduate research, program, and professional activities committee. Each student is expected to show continued progress and, in particular, to develop habits of critical analysis and dialogue. Unsatisfactory progress will be brought to the attention of the graduate research, program and professional activities committee for recommended action by the faculty.

Upon completion of the program, and with the approval of a majority of the graduate faculty, the Ph.D. student will offer for a comprehensive written and oral examination two subfields within the following three fields of specialization: Physical Environmental Systems; Resource Management Systems; and Systems of Cultural Adaptation.

The written portion of the comprehensive examination will be prepared by the student's doctoral committee which will evaluate the performance and judge the student's success or failure. The examination then will be circulated to the graduate faculty.

The graduate faculty will be invited to the oral examination which takes place in not less than one week nor more than two weeks from the time of the written examination. The oral examination will be conducted by the student's doctoral committee with appropriate opportunity for all graduate faculty to ask questions. The student's success or failure of the oral examination will be judged by the student's doctoral committee.

The doctoral student will present his dissertation proposal at an open meeting of the Department of Geography, having passed the comprehensive examination. The written and oral examination and presentation of the dissertation proposal are prerequisite to admission to candidacy.

The Dissertation

The student's written dissertation will be circulated to members of his doctoral committee two weeks in advance of the proposed defense. The doctoral committee will announce a public invitation a week in advance and will hear the student's defense at the place and time approved by the Graduate School. The finished dissertation will be sent to the student's

doctoral committee for approval. The judgement of the official committee will be expressed to the student and forwarded to the chairman of the department for recommendation of the Graduate School for conferring of the Ph.D. degree.

Geology

The Department of Geology offers a program leading to the Master of Science degree.

Master of Science Degree

Entering students are required to take a placement examination which is administered at the beginning of the Fall and Spring terms each year. All students are expected to be familiar with the Department of Geology policies and requirements. Master's candidates must pass a written comprehensive examination at least six months prior to completion of a thesis. All students are expected to give evidence of competence in the basic sciences. A total of forty-eight hours of graduate work with an average grade of *B* or better constitute the minimum credit requirements. A final oral examination, primarily concerned with defense of the thesis, is administered as the last step before graduation.

The objective of the master's program is to develop the student's competence in the basic fields of geology and to provide for specialization dependent on student and faculty interest. Facilities and staff are available for studies involving surface and subsurface mapping, structural geology, petrology, paleontology, micropaleontology, palynology, paleoecology, coal petrology, coal geology, stratigraphy, sedimentation, sedimentary environments, crystallography, mineralogy, low temperature geochemistry, ore deposits, petroleum geology, environmental geology, hydrogeology, and exploration geophysics. Many of the faculty are actively conducting research in which statistical and computer techniques are applied to problem solving in the earth sciences. Interdisciplinary research with other departments is encouraged. Preparation for teaching earth science at the high school and junior college level may also be undertaken in cooperation with the College of Education and other science departments.

Southern Illinois and adjacent areas offer a wide variety of geological conditions ideal for individual study and research. Experienced staff members work closely with students and provide individual assistance when necessary. Graduate teaching, research and field assistantships are available to qualified students. The Illinois State Geological Survey and several major companies in the petroleum industry actively support geological work in this area.

Government

The Department of Government has a balanced graduate program in political science. Graduate courses in government may be taken as a major or cognate leading to the Master of Arts degree, as a part of a social studies major toward the Master of Science in Education degree, and as a major leading toward the Doctor of Philosophy degree.

Graduate study is organized by areas and fields of study. Each area is composed of a number of fields. The areas and fields are:

Area A—Political Theory and Methodology

- (1) History of political theory
- (2) Normative political theory
- (3) Research methods
- (4) Empirical political theory
- (5) Polemics
- (6) Didactics

Area B—American Government

- (1) The legislative-executive process
- (2) Administration, the decision-making process, and organizational behavior
- (3) Political behavior and the electoral process
- (4) Public law and the judicial process
- (5) Public policy (including foreign policy)
- (6) Psychology and politics
- (7) State, local, community, and urban political behavior and political structures
- (8) Theory and concepts of study

Area C—Comparative Government

- (1) The political system of foreign countries or areas
- (2) General processes and institutions, such as comparative political development, comparative political sociology, comparative administration, comparative political parties, or another approved topic in comparative politics
- (3) Theory and conceptual approaches to comparative study

Area D—International structures, processes, politics and theory

- (1) International politics
- (2) International organization
- (3) International law
- (4) Foreign policy of a major country or area of comparative foreign policy
- (5) International relations theory

Area E—Cognate and Interdisciplinary fields (This area shall not be used to satisfy the tool requirements)

An approved field in any of the following subjects or other related or appropriate subject:

History, economics, philosophy, etc. or any approved interdisciplinary group of courses

Study requirements

Each candidate for the Ph.D. degree must offer six fields of study selected from at least four areas. Four fields will be satisfied by written preliminary examination. These four must be drawn from not less than three areas of study. Two fields will be satisfied by the completion of eight hours of graduate course work (either 400 or 500 level courses) with a grade of not less than B. The courses may include those taken in the M.A. program.

All candidates for graduate degrees will be expected to select one of these areas as their major field and to demonstrate special competence both in that field and in a limited number of other areas of concentration.

Application for admission to graduate study in government should be directed to the Graduate School. This application should be accompanied by: three copies of a complete transcript of all undergraduate and grad-

uate work. Supporting materials for the application should be sent to the director of graduate studies in the government department. These materials consist of (1) a personal and professional data form, and (2) three letters of recommendation from former teachers or supervisors. The official forms for these materials may be obtained from the director of graduate studies, Department of Government. Also required in support of applications are scores on the Graduate Record Examination (verbal, quantitative, and advanced). The GRE will be waived temporarily only on the condition that it is not possible for the student to take the examination within a given period of time. In this event, the student is required to take the examination at the first opportunity after arrival on campus. Applications and supporting materials should be submitted at least eight weeks prior to the beginning of the quarter in which the student expects admission to study.

Departmental processing of applications for acceptance as a graduate student in government is the joint responsibility of the department's director of graduate studies and its graduate studies committee. The director of graduate studies serves as adviser for all graduate students until such time as a faculty adviser or committee is named for the individual student, which will normally be done not later than the end of the first quarter in residence.

Master of Arts Degree

Requirements for admission imposed by the department are in addition to those of the Graduate School. The department will ordinarily accept as candidates for the master's degree only those applicants who: (1) have graduated from an accredited four year college or university; (2) have completed a minimum of 24 quarter or 16 semester hours in the field of government or political science; (3) have a 3.7 (5-point scale) over-all grade point average, or alternatively, 3.9 over-all for the last two years of undergraduate work; and (4) have a 4.0 over-all average in government or political science. Applicants who do not meet these minimal requirements or their equivalent, but who do meet the minimum standards of the Graduate School, can be considered for acceptance only on petition to the department's graduate studies committee which, if granted will be accompanied by a statement specifying the special conditions or requirements of admission.

A minimum of 48 quarter hours of credit, no more than 9 of which may be for the thesis, constitutes the basic course requirements for the Master of Arts degree. At least 24 of these hours must be at the 500 level. The course work must be so planned as to include at least 8 hours of work in each of three areas of study.

A student who completes only the minimum of 48 hours of course work may devote no more than 8 of those hours to courses outside the department unless the work is in a cognate field which has been approved as a replacement for one of the areas of concentration within the department. In the latter event, as many as 16 hours in outside fields may be counted within the 48 hour minimum.

Each candidate for a Master of Arts degree must include in his studies the departmental courses in the scope and method of political science—Government 500a and Government 500b. Candidates for the Master of Arts must demonstrate proficiency in one of the three following areas:

(a) a modern language, (b) statistics, and (c) computer programming. The method of demonstrating proficiency is the same as that followed by candidates for the Ph.D. degree.

A student must maintain an overall 4.0 (5 point scale) grade point average in order to be eligible for the Master of Arts degree.

An advisory committee is chosen for each student. All elements of the student's program must receive the approval of this committee. A thesis is required for the Master of Arts degree, the topic of which is chosen in consultation with the adviser at the earliest practical time. This requirement may be satisfied by an internship report of the same type and quality as a thesis.

The final oral examination will cover the thesis and the major area in which it was written, and it may also test the candidate's general competence in the field of government.

Doctor of Philosophy

An advisory chairman and committee are appointed for each student studying toward the Ph.D. degree. All elements of the student's program of studies must receive the approval of this committee. The study program is worked out by each student in consultation with this committee.

At least one year (3 academic quarters) in residence is required prior to the administration of the comprehensive preliminary examination preceding admission to candidacy. The course work must be so divided among the various areas of study as to satisfy departmental requirements and prepare the candidate for the preliminary examination.

At least one half of the course work must be at the 500 level. Government 500a and b are required.

Each Ph.D. student must satisfy the requirements for two tool subjects which consist of any combination of two languages, statistics, and computer science. Language proficiency may be demonstrated either through course work or proficiency examination. The national Educational Testing Service foreign language examination is used for the common languages (Spanish, French, German, Russian), and a special examination is used for the uncommon languages (Arabic, Vietnamese, Chinese, etc.). Alternatively, the language requirement may be satisfied through the successful completion of the three-course sequence offered by the foreign languages department (288a,b, and c) with a minimum grade of *B* in the final course of the sequence. Where the foreign languages department recommends that the student start at the 288b or c level, the completion of only the recommended courses of the sequence satisfied the language requirement.

Proficiency in computer science may be demonstrated either through course work or proficiency examination, or through a combination of course work and proficiency examination. The course-work method involves the successful completion of three courses in the computer science department (usually, 202, 302a, 302b) approved by the student's graduate study committee. A grade of *B* is required in the two more advanced courses. Alternatively the student may choose successful passage of a proficiency examination prescribed by a special committee of faculty in the Department of Government.

The comprehensive preliminary examination is given only when the applicant has completed all required courses, has completed the required period of residence and has satisfied the language or equivalent require-

ment. The examination is both oral and written, and must be completed within a two-week period. The student is tested in four of the six areas of graduate study. Among the four, American government and policy and either comparative politics or international relations are required. Substitution of cognate areas is permitted if approved by the student's advisory committee.

A dissertation showing high attainment in independent, original scholarship and creative effort must be completed in meeting the final requirements of the degree of Doctor of Philosophy. The final examination is oral and devoted primarily to a defense of the dissertation.

Guidance and Educational Psychology

The Department of Guidance and Educational Psychology offers programs at three levels. The Master of Science in Education degree, Sixth-Year Specialist's certificate program, and Doctor of Philosophy degree in education are awarded after completing an appropriate series of learning experiences in approved curriculum.

Admission and Advisement

Admission to the programs is in accord with requirements of the Graduate School. Persons seeking admission for the master's and specialist's degrees should make application to the Graduate School through forms which may be obtained from the department. Completed forms together with test scores constitute an admission dossier which is reviewed by a standing committee. Admission is generally granted six weeks before the beginning of a quarter and applicants should file materials well in advance of a term in which they desire admission. Advisement for all programs of the department is decentralized and students are assigned to members of the faculty at the time of admission.

Master's Degree in Guidance

The master's degree program offers two 48-hour curricula. One in elementary guidance and one in secondary guidance. Both curricula are designed for persons seeking Illinois guidance certification and presume either Illinois teacher certification or concurrent completion of teacher certification curriculum.

Master's Degree in Educational Psychology

A 48-hour curriculum in educational psychology is available for persons seeking preparation in the analysis of learning and child study. It is not related to teacher certification but is intended to provide a basis for research work in the schools or advanced work in educational psychology at the doctoral level. A comprehensive examination and a thesis are required.

Sixth-Year Specialist's Certificate

A Sixth-Year Specialist's certificate is offered in guidance and pupil personnel services. This program is offered through the department and is intended to provide background and training to qualify for administrative or special counseling positions in school guidance or pupil personnel programs or school psychology internships. A comprehensive examination and research paper are required.

Admission to the specialist program is through the Graduate School and

the Department of Guidance and Educational Psychology. A master's degree or its equivalent is a prerequisite. The specialist program is intended to result in a terminal specialist certificate.

Doctor of Philosophy

Guidance and Educational Psychology participates in the doctoral program in education in the functional area of educational psychology. Students interested in counseling, educational measurement and statistics, and human learning may pursue an equivalent of a major concentration within the area program. For additional information on the Ph.D. in education, see the preceding section entitled Education. Inquiries should be addressed to the coordinator for the area of educational psychology in the College of Education.

Health Education

Master of Science in Education

Master of Science in Education degree programs are offered in health education. The candidate may select from three areas: school health education, community health education, and safety education. A common core of 20 quarter hours in health education is required of all master's degree candidates.

SCHOOL HEALTH AND SAFETY EDUCATION

In school health and safety education, two programs may be followed: (1) a minimum of 24 hours in health education, a minimum of 16 hours in a minor field, and 8 hours, with departmental approval, from other graduate courses in the University; or (2) a maximum of 40 hours in health education and 8 hours from an approved field of education.

COMMUNITY HEALTH EDUCATION

The program in community health education extends over four quarters of study with 60 quarter hours required for the degree. In addition to the common core of 20 hours in health education required of all master's candidates, the community health education concentration requires Health Education 488, 489, and 500; a minimum of 4 quarter hours in foods and nutrition; 4 quarter hours in communications or group work methods; a full quarter as a field intern (Health Education 590); and, electives to 60 quarter hours.

Doctor of Philosophy Degree

The Doctor of Philosophy degree in education with concentration in health education is provided through the functional areas of (1) curriculum and instruction and (2) administration and social and philosophical foundations. Students wishing to pursue the advanced degree will receive individual guidance from the graduate adviser in health education appointed through the appropriate functional area.

Higher Education

This department provides graduate offerings in higher education studies in support of the Master of Science in Education and Doctor of Philosophy degrees.

The department administers programs leading to master's degree concentrations in college student personnel, academic administration, college and university business affairs, and community or junior college teaching. A special internship program for the preparation of teachers for community colleges and technical institutes has been a shared project of Southern Illinois University and the Junior College District of St. Louis-St. Louis County, Missouri, since 1966 (funded in major part by the Ford Foundation). Students interested in one of these master's programs may obtain information and advisement from the advisers of the respective programs through the Department of Higher Education.

For the Doctor of Philosophy degree the faculty members of this department comprise the graduate faculty of the higher education concentration for the functional area of administration and social and philosophical foundations in the College of Education.

Qualified students accepted in any program in the department may apply for fellowships granted through the Graduate School. Information concerning these fellowships and other kinds of financial support may be obtained by writing the department chairman.

History

General Information

Graduate work in history is offered at both the master's and the doctoral levels. Admission to programs administered by the Department of History must be approved by the department, with approval dependent upon the preparation, ability, and promise of the individual student. For the Master of Arts degree, the department has no formal admission requirements beyond those of the Graduate School. For admission to the doctoral program, each applicant should submit to the department, in addition to the material sent to the Graduate School, the following letters and report: three letters from former teachers, preferably at the graduate level; a letter in which the applicant expresses his professional and personal objectives; and a report of the result of the aptitude test (both verbal and quantitative) and the advanced test in history of the Graduate Record Examination.

Fellowships and teaching assistantships are available to qualified graduate students. All carry stipends, and remission of tuition. Applications for these awards should be submitted by February 1.

Additional information concerning the graduate program in history may be obtained by writing to the chairman, Department of History.

The Master's Degree

History may be chosen as a major or minor for the Master of Arts degree and as the subject-matter major for the Master of Science in Education degree. Four major areas of historical study are offered: American, Latin American, European, and Asian or African. Candidates for the M.A. degree must consult with the graduate adviser in the Department of History before registering for courses. Candidates for the M.S. in Education degree must consult with the appropriate adviser in the Department of Secondary Education before registering for courses.

For the Master of Arts degree in history, 48 quarter hours of satisfactory graduate work are required; at least 24 of these 48 hours must be on the 500 level. Within this general requirement, at least 32 quarter

hours must be in appropriate history courses, with at least 16 of the 32 hours on the 500 level. The remainder of the hours may be taken in courses on the 400 level. The Department of History strongly recommends that each candidate be enrolled in at least one 500-level course each quarter during his first three quarters in the program. A candidate for the Master of Arts degree must pass a reading examination in a foreign language. With the approval of the department, statistics or computer programming may be substituted for the foreign language. He may elect to fulfill the research requirement through either the thesis or the non-thesis program.

A candidate in the thesis program should, with the approval of the chairman, select a thesis adviser and a thesis topic by the end of his second full-time quarter in the program. As many as nine quarter hours may be in thesis research. The candidate must submit an acceptable thesis, and pass a comprehensive oral examination covering his fields of specialization and his thesis.

A candidate in the nonthesis program must receive an *A* or *B* in two separate research seminars, and copies of his research paper from one of these seminars must be filed with the department and the Graduate School. Each candidate is required to pass a comprehensive oral examination conducted by a three-man committee. The two fields may not be in the same division.

Division I—American History

Colonial

United States, 1776–1865

United States, 1865–1919

United States, 1919 to present

Mississippi Valley and Illinois

Division II—Latin American History

Colonial

19th Century

20th Century

Division III—European History

Ancient

Medieval

England since 1600

Europe, 1450–1789

Europe, 1789 to present

Division IV—Asian or African History

The Doctor of Philosophy Degree

Candidates in history for the Doctor of Philosophy degree must complete at least two years of full-time graduate work beyond the bachelor's degree or one year beyond the master's degree (or its equivalent), and submit a satisfactory dissertation. The courses and hours of credit necessary for a doctoral student to prepare for preliminary examinations will be determined by the student's advisory committee. The goal is to develop high competence in the five selected fields in which he will be examined.

The department requires all candidates to pass a reading examination in two foreign languages. With the approval of the department, statistics or computer programming may be substituted for one language. The language requirement must be satisfied prior to the preliminary examinations.

The department offers advanced study in fifteen fields of history which are grouped in four major divisions.

Division I—American History

Colonial

United States, 1776–1865

United States, 1865–1919

United States, 1919 to present

Mississippi Valley and Illinois

Division II—Latin American History

Colonial

19th Century

20th Century

Division III—European History

Ancient

Medieval

England since 1600

Europe, 1450–1815

Europe, 1789 to present

Division IV—Asian History

East Asia

South Asia and Southeast Asia

Each student will be responsible for five fields; either all five in history or four in history and one in a minor subject. For his preliminary examinations, the student will present four fields, all in history or three in history and one in a minor field. He will be certified in a fifth field, either in history or in a minor subject, by taking such courses and passing them to the satisfaction of his advisory committee and the professors in that field. Not more than three fields may fall within any one of the above divisions. The preliminary examinations will consist of a three-hour written examination in each of his four fields and two-hour oral examination covering all fields.

After completing his course work, fulfilling the foreign language requirements, and passing the preliminary examinations, the student will be admitted to Ph.D. candidacy and devote his time to the dissertation. Dissertation subjects must be chosen from either American history, Latin American history, or European history. Subjects in American history may fall within any field listed in division I above. Subjects in Latin American history should come from the following areas: regions of special concern to the United States (e.g. the Caribbean), rapidly developing regions (e.g. Mexico), and underdeveloped areas (e.g. the Andean states), with major attention falling within the nineteenth and twentieth centuries. The final oral examination will cover the field of the dissertation and related matters.

Assistantships and Fellowships

Fellowships and teaching assistantships are available to qualified graduate students. All carry stipends, and remission of tuition. Applications for these awards should be submitted by February 1.

Additional information concerning the graduate program in history may be obtained by writing to the chairman, Department of History.

Home Economics

The Master of Science and Master of Science in Education degrees with a major in home economics are available with specializations in:

1. Child and Family
2. Clothing and Textiles
3. Family Economics and Management (including Interior Design)
4. Food and Nutrition
5. Home Economics Education

Prerequisites for Admission to Graduate Study

1. Admission to the Graduate School.
2. Completion of a curriculum in home economics or in a field related to the area of specialization, such as biological, physical, and social sciences, art, business, and communications. When necessary, deficiencies may be made up concurrently.
3. Satisfactory scores on the Graduate Record Examination.
4. An undergraduate grade point average equivalent to 3.70 or above. Conditional admission may be granted where the grade point average is above 3.40 but below 3.70.
5. A scholastic record that indicates ability to pursue advanced study in the chosen major field.
6. Demonstrated ability to write effectively as indicated by scores in English composition. In the case of foreign students an official statement showing sufficient proficiency in English is required.
7. The student attains full graduate standing in home economics when he has met the above requirements and has made satisfactory scores on the Ohio State Psychological Examination.

Requirements for the Master of Science

In addition to the general requirements of the graduate school, requirements for the master's degree in home economics are:

1. Thirty to thirty-two quarter hours in the field of specialization plus 16–18 quarter hours in approved related fields with a minimum total of 48 quarter hours, 24 of which must be in courses at the 500 level.
2. The required courses for all master's degrees in home economics are: Guidance 505 or equivalent, and Home Economics Education 500–4 or equivalent. A thesis or research paper is required.

Additional requirements may be specified for each major. It is expected that the individual program will be planned by the student and the adviser to supplement the student's previous training and experience, with due consideration given to the student's objectives.

Requirements for the Master of Science in Education

Thirty-two hours in the field of home economics are required for a major, with a 16-hour minor in education. The student's graduate committee may require a program including additional credit. Required courses are Guidance 505 or equivalent, Home Economics Education 500, 505, 506, 599 (Thesis). As an alternative to writing a thesis, specific courses on the graduate level as recommended by the student's advisory committee and approved by the dean of the Graduate School may be taken; each student who does not write a thesis must submit to the Graduate School,

for its permanent records, a copy of a research paper as evidence of his knowledge of formal research techniques.

Instructional Materials

The Department of Instructional Materials offers courses of study leading to the Masters of Science in Education degree. Concentration of study may be in any of the three areas: instructional materials, audiovisual, or library service. The concentration of instructional materials is recommended for most students, for it gives a broader base of study and the public schools are moving toward instructional materials centers rather than toward the separate areas of audiovisual and library service.

The graduate major concentration in instructional materials, toward a Master of Science in Education degree, involves professional training in both audio-visual education and school library service. It meets the state and national certification standards for full-time school librarians and the standards recommended by the Association for Educational Communication and Technology of the National Education Association. In Illinois every school librarian is also required to have earned a teaching certificate.

Fifty-two hours are required for the major. No minor is required. At least 26 hours must be in courses numbered 500 or above. The following courses are required: 413, 417, 510, and 514.

The minor in school library service is offered for students taking a major in another area. This, consisting of a minimum of 16 hours, is intended primarily for teachers who wish to obtain an appreciation of literature for children and adolescents. It is not intended for the preparation of professional school librarians. The following courses are required: 405, 406, 514, and at least 4 hours from 420, 510, 530, or 576.

The Doctor of Philosophy degree in education with a concentration in learning resources may be taken either in the functional area of educational psychology or curriculum and instruction. The procedures and qualifications are those established by the functional areas and information can be obtained by writing to the coordinator of the educational psychology or curriculum and instruction functional area, College of Education.

The doctoral program in learning resources is designed for those individuals who wish to become directors of instructional materials in a large school system, a college, a university, or industry where the scope of the program will require, under the director, separate specialists in the audiovisual and library fields. The graduate of this program would be able to plan long range activities for his unit, work with curriculum committees, with administrators, and with specialists such as psychologists, research directors, and directors of reading centers.

For further information concerning major and minor programs, work experiences, job opportunities, or other related matters, consult the chairman, Department of Instructional Materials.

Inter-American Studies

Course work in the inter-American studies field is offered by the Departments of Anthropology, Economics, Foreign Languages, Geography, Government, and History.

Prerequisites for the Master of Arts degree include a command of the Spanish language adequate to meet the student's needs for research and communication within the area of his program. The director of the Latin American Institute and the supervisory committee will determine the student's linguistic competence on registration and, where necessary, specify what the student must do to improve his proficiency in Spanish. Whenever the student's program involves the need for Portuguese or French, he will also need to demonstrate or attain satisfactory proficiency in that language. In addition, a satisfactory basic preparation in inter-American studies is required.

Requirements for the Master of Arts Degree

1. The completion of at least 30 hours of courses acceptable for graduate credit in one of the above listed departments.
2. The completion of a minimum of 18 hours of related studies approved by the student's supervisory committee which will meet the requirement for a minor in the Latin American Institute. A maximum of three areas is permitted in the field.
3. The completion of a satisfactory thesis on a Latin American topic in the major for which 5 to 9 hours of credit are given.

A minor in inter-American studies for those students with a major in a department outside of the institute will consist of a minimum of 18 hours to be taken in two of the participating departments. Specific course programs will be worked out by the director of the institute in consultation with the chairmen of the departments involved.

In every case the student's final program must be approved by the graduate supervisory committee, acting under policies established by the Latin American Institute and the Graduate School.

Journalism

Course programs in journalism leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees are offered by the School of Journalism. Each graduate student's total program will be designed specifically for that student by the student in consultation with his academic adviser. Although the mere accumulation of credit hours should not be the objective of any student, minimum course requirements are set forth for both the master's and Ph.D. degrees.

Master's Degree

Candidates for the master's degree must complete a minimum of 48 quarter hours of graduate work, including the thesis. Approximately half of the course hours must be earned in journalism and half in non-journalism disciplines. Each student will be challenged to demonstrate a capacity for investigation and independent thought in his thesis. Students who pass the ETS Graduate Foreign Language Examination in addition to all other requirements qualify for the Master of Arts degree.

Doctor of Philosophy Degree

Minimum course requirements for the Ph.D. degree will include 96 quarter hours beyond the bachelor's degree. Students generally will include a minimum of 36 quarter hours in journalism, 24 quarter hours in

each of two non-journalism areas of study, and 12 quarter hours of electives. The student will complete at least 48 quarter hours of course work beyond the master's degree. These course requirements do not include credits earned in dissertation, Journalism 600.

Each student will propose to his academic adviser early in his second quarter a listing of courses to be included in his study program with a statement of justification for these courses. Revisions may be made in his course of study only with the written approval of his academic adviser. In preparing a course proposal, the student is encouraged to deviate from the 36-24-24-12 hour course requirements outlined herein when to do so enables him to devise a rigorous program which best meets his academic and professional needs.

The Ph.D. student, in consultation with his academic adviser, will elect two from among these five research tool combinations:

Journalism 432, 433a,b

Journalism 590, History 452, Government 500a

Guidance 505, 506, 507 or Mathematics 410a,b,c

Computer Programming

Modern foreign languages (pass ETS test in one or two from among those approved by the Graduate School).

Courses listed as tools are subject to change without notice, at times when departments change course titles and numbers.

A student may propose other research tools for the consideration of his academic adviser who, in consultation with the school's graduate faculty admission and retention committee, may approve, modify, or reject the proposal. Courses taken to satisfy research tool requirements may not be counted for Ph.D. degree course credits.

Doctoral students who enroll, either for course credit or for research tool requirement, in one of two major research areas within the department (behavioral and historical) will be encouraged to take at least the basic course in the other research area.

In addition, each student will be required to undergo, usually during his first term, an evaluative process (exam or directed study) designed as a guide to counseling and advising; undergo written and oral preliminary examinations in both his journalism and non-journalism areas of study; prepare a dissertation based on original, scholarly research; stand oral examination over the dissertation; and fulfill all the Graduate School requirements.

Linguistics

Graduate courses in theoretical and applied linguistics are offered leading to the Master of Arts degree in linguistics or in English as a foreign language. Courses, both undergraduate and graduate, are also offered for a minor in linguistics; only graduate courses are offered for a minor in English as a foreign language. Applicants for admission should send inquiries to the chairman, Department of Linguistics, Southern Illinois University, Carbondale, Illinois 62901.

Master of Arts Degree in Linguistics

Applicants for admission to the linguistics program, besides meeting the general conditions for admission to the Graduate School, must

have an undergraduate average of at least 4.0 (on a 5.0 scale). They must also satisfy the following additional prerequisites: a set of courses corresponding to Articulatory Phonetics (402a), Introduction to General Linguistics (401a), and Introduction to Structural Linguistics (401b). Applicants with partial deficiencies in the above prerequisites may be provisionally admitted until the prerequisites are met. With regard to these prerequisite courses (which do not carry degree credit), the student who believes himself capable in the material of any of these courses may ask that a proficiency examination be administered. Such an examination will be equal in scope to that usually given at the end of the course. Candidates for the M.A. degree must have current proficiency in a language other than English; this may be native proficiency or the equivalent of the proficiency expected after three academic years of course work. In cases in which there is doubt about the currency or the degree of proficiency, formal language tests will be administered. An undergraduate background in linguistics, foreign languages, English, anthropology, psychology, mathematics, or philosophy is desirable though not required.

For the major, students are expected to take a minimum of 24 hours in linguistics including 2 courses at the 400-level (405, 408), 4 courses at the 500-level (505, 506a, 508, 550a or b), and 20 hours in an elective area. In the elective area the student has the option of an inside minor, which is an additional concentration exclusively on courses in linguistics, or an outside minor. The outside minor may be in a language area (courses dealing with the structure, phonology, and history of individual languages or families of languages) or a related area (e.g. language learning, English as a foreign language, language and culture, instrumental phonetics, literary studies, including stylistics) in cooperation with other departments of the University.

At the end of their course work, students will take a comprehensive examination covering the areas of their concentration. This examination may not be taken more than twice.

A thesis is required for the M.A. in linguistics. The student, in consultation with his departmental academic adviser, will select a chairman and two other faculty members to serve as his thesis committee; the executive committee of the department must approve the structure of the thesis committee. The chairman is to be a member of the graduate faculty of the Department of Linguistics. One or both of the other committee members may be from outside the department. The topic of the thesis may come from the major field of linguistics, or from the area of the student's minor, with the stipulation that the topic be demonstrably related to the major in linguistics. In the latter case, the thesis committee may be cochaired by a faculty member outside of the Department of Linguistics.

The total credit requirements is a minimum of 49 quarter hours. Students are encouraged to attend the summer linguistic institute of the Linguistic Society of America; credit will be allowed for course work successfully completed.

Master of Arts Degree in English as a Foreign Language

Applicants to the program in English as a foreign language, besides meeting the general conditions for admission to the Graduate School, must have an undergraduate average of at least 3.8 (on a 5.0 scale). An undergraduate background in any of the following fields is desirable: English,

anthropology, foreign languages, philosophy, psychology, mathematics. Those applicants who have less than a 3.8 average or who have an undergraduate background other than those specified may be admitted only after consultation with the chairman of the program. Applicants who are not native speakers of English must meet the following additional requirements: undergraduate concentration, or the equivalent, in English language or literature; TOEFL examination score of at least 550; and satisfactory English language proficiency in the language examinations administered on arrival at the University. Deficiencies will be made up as necessary.

The curriculum is designed to give systematic work in both theoretical linguistics and applied linguistics (methodology of the teaching of English as a foreign language). For the major, students are expected to take 32 hours of theoretical linguistics, (401a, 401b, 402a, 403 or 405, 408, 501, 508 Anthropology 401), 12 or 13 hours of applied linguistics, (570, 571, 572, 573 or 580), and 3 hours of a related elective. Students must maintain an average of *B* for the first 26 hours (approximately 2 quarters) of graduate work in order to qualify to take the written comprehensive examination required for the M.A. in English as a foreign language. This examination may not be taken more than twice. If the candidate does not qualify to take the comprehensive, or if he fails it twice, he will receive a certificate of attendance. A thesis is not required for the M.A. in English as a foreign language; the candidate must submit to the chairman a clean copy of a research paper (approved in one of his courses) for submission to the Graduate School. Although there is no formal language requirement for the M.A. in English as a foreign language, all students without previous experience in a foreign language are strongly urged to study a language during their graduate work in the Department of Linguistics.

Mathematics

Graduate work in mathematics is offered leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. Major or minor work for the Master of Science in Education degree and minor work for graduate degrees in other fields are also offered. In addition to the general rules, regulations, and requirements of the Graduate School, the following specific requirements pertain to the various degrees available with a major in mathematics. The department should be consulted for complete details.

Master of Arts Degree

1. Course work must include: Mathematics 501a,b,c; 520a,b,c; at least two quarters of one other 500-level sequence in mathematics. Graduate credit in mathematics must total at least 48 hours.
2. Demonstrated ability in reading mathematical literature in French, German, or Russian.
3. A thesis carrying 5 to 9 hours credit in Mathematics 599.
4. Satisfactory performance on a written examination (usually given in the spring quarter) in the following areas: (1) real analysis (452a,b,c; 501a,b,c); (2) algebra (421a,b; 520a,b,c); one chosen by the student and represented by two quarters of one other 500-level sequence in mathematics.
5. Satisfactory performance in an oral examination over the thesis and

such other material as the examining committee may feel is most appropriate.

Master of Science Degree

1. Course work must include the following: Mathematics 419a,b; 421a,b; 433a,b; 452a,b,c; one sequence from Mathematics 426a,b; 475a,b; 480a,b; at least three 500-level sequences, one of which includes the c course. Graduate credit in mathematics must total at least 48 hours.

2. Demonstrated ability in reading mathematical literature in French, German, or Russian.

3. A research paper carrying 3 hours credit in Mathematics 595 or the successful completion of a four-quarter graduate seminar, carrying a total of 4 hours credit.

4. Satisfactory performance on a written examination in 419a,b; 421a,b; 433a,b; 452a,b,c; and one 500-level a,b,c sequence.

5. Satisfactory performance in an oral examination over the research paper and such other material as the examining committee may deem appropriate. No oral exam is required for those successfully completing the four-quarter seminar option.

Doctor of Philosophy Degree

A student will be considered for acceptance into the Ph.D. program if he has demonstrated above average performance in graduate work comparable to that required for a master's degree at most American universities. Once accepted, the requirements are:

1. Satisfactory performance on a comprehensive examination in real analysis, algebra and topology at a level commensurate with the courses 501a,b,c; 520a,b,c; 530a,b,c.

2. Demonstrated reading competence in mathematics in two of the languages; French, German, Russian.

3. Graduate course work (including dissertation credit) beyond that required for the master's degree must total at least 96 quarter hours of credit. Course work must include 18 hours in one field (major) and 9 hours in two other fields (minor) from the following list: algebra; analysis; applied mathematics; differential equations; geometry; logic; number theory; probability and statistics; topology. The course work in the major and minor areas must be at the 500-level and be exclusive of the three-quarter core sequences 501, 520, 530, 555.

4. Satisfactory performance on a preliminary examination (generally consisting of both written and oral parts). The material of the examination will be determined by the student's advisory committee.

5. A dissertation (representing at least 36 hours of credit in Mathematics 600) demonstrating the candidate's capacity for original and independent research in an area of concentration chosen from the nine listed in item 3 above. The candidate will also be examined orally on his dissertation.

Microbiology

Graduate courses in microbiology may be taken as a major or minor leading to the Master of Arts degree, or as a part of a biological sciences program leading to the Master of Arts, Master of Science, and Master of Science in Education degrees.

The Doctor of Philosophy degree in microbiology will be awarded to a candidate in recognition of achievement in independent research and in advanced studies. His original contribution to knowledge, evidenced in the dissertation, together with a superior comprehensive scholarship record and satisfactory completion of prescribed examinations are the criteria for the degree. Emphasis will be placed on his critical evaluation of, and familiarity with, the existent developments in microbiology and related areas of study.

The Department of Microbiology offers facilities for research in microbial genetics, cytology, radiation biology, physiology and biochemistry of microorganisms, medical microbiology, immunology, and virology. In addition to the library facilities, reprint collections covering many topics in microbiology are available for student use.

To be eligible for the Doctor of Philosophy degree, the student must satisfy the following requirements: (1) He must complete at least 144 hours of graduate work and research. Credit for research may not exceed 60 of the 144 hours; (2) He must demonstrate his proficiency in statistics and his ability to read, with reasonable facility, scientific literature in one modern language; (3) He must pass the qualifying examination and a final oral examination; and (4) He must submit an approved dissertation based on his research.

A minor may be elected as part of a doctoral program in microbiology, subject to approval of the department, from courses in any program which constitute a major for the master's degree. A minor in microbiology for the doctorate in another biological science consists of general microbiology and 20 hours selected from courses offered by the department.

Molecular Science

Graduate work in molecular science may be taken as a major or minor leading to the Doctor of Philosophy degree. This program, an interdisciplinary program with a core in theoretical and applied physics, presently includes research in the areas of atomic-molecular physics, biophysics, crystallography, geochemistry, materials science, mathematical physics, molecular genetics, nuclear physics, and solid-state physics. It affords the student a unique opportunity to work with the research faculty and facilities in related areas throughout the University and to specialize, if he chooses, in problems embracing several academic disciplines. A molecular science committee appointed by the dean of the Graduate School from eligible graduate faculty members of the various interdisciplinary areas is a continuing body for overseeing and evaluating the program. The chairman of the Department of Physics administers the program, subject to the policies set forth by the molecular science committee, the Graduate Council, and the dean of the Graduate School.

In addition to the general rules, regulations, and requirements of the graduate school, the following specific requirements pertain to the Doctor of Philosophy degree in molecular science:

Admission to the Program

1. A master's degree or equivalent from any area of the physical and life sciences, engineering, or mathematics is required for admission to the program.

2. Competence in French, German, or Russian, as demonstrated by

passing the ETS Graduate Foreign Language examination is required for admission to the program. Another language, highly pertinent to a particular research area, may be substituted if a formal petition is approved by the molecular science committee. Passing scores on the ETS exams are determined by the Graduate School.

Admission to Candidacy

1. Passage of a preliminary examination, both written and oral, in the four core areas of theoretical and applied mechanics, theoretical and applied electrodynamics, quantum theory, and statistical physics, and in one specialty area selected by the student.

2. Demonstrated competence in a second research tool. This may be accomplished through an ETS examination in a foreign language, or by satisfactory completion of the certification procedures for statistics or computer programming as administered by the Graduate School.

Dissertation

1. A dissertation and its defense with distinction before a committee.

The Administrator of the molecular science program should be consulted for complete details.

Music

The master's degree in music consists normally of a total of 48 hours of work in an area of specialty outlined below. Further work may be required in certain cases. Candidates for the Master of Music, Master of Music Education degree, or the Doctor of Philosophy degree in education who wish to choose applied music courses as electives will take the 400-series course in their major instrument or voice. Applied music majors in the Master of Music curriculum will take the 500-series course in their major instrument or voice for 4 hours per quarter. These are artist-level courses, and admission to them and to the degree program must be obtained from the chairman of the department after passing a jury examination.

Proficiency examinations will be given to all entering students and comprehensive examinations will be administered during the terminal quarter. Please consult the *Handbook for Graduate Study in Music* for more detailed information.

Master of Music Degree

Requirements include 18 hours in the major area for history-literature and theory-composition, and 12 hours for applied major concentration; Music 501-3, 502-6, 599-3 to 9 (thesis), and electives in music to make a total of 48 hours.

Thesis credit for the applied major may be met by presenting a full recital for 6 hours credit and a research document for 3 hours credit.

Master of Music Education Degree

A minimum of 12 hours must be in music education courses. A maximum of 8 hours may be elected in fields outside music after consultation with the adviser. Other requirements include Music 501-3, 503-3, and 599-9 (thesis, or 9 hours of course work as approved by the director of graduate studies), and electives in music to make a total of 48 not less than

hours, of which 9 hours must be in the areas of graduate theory and/or music literature. At least two quarters of ensemble experience are required and can be counted as part of the major.

For specific repertoire requirements in each course see the Applied Music Appendix of the Department of Music.

Occupational Education

Students may pursue the Master of Science in Education degree—48 quarter hours of course work or the Master of Science degree with a major in occupational education—48 quarter hours, including 5 to 9 hours of thesis.

Programs of study are developed by the student and his adviser depending upon deficiencies, interests, and career goals. Programs are flexible, and course work may be done in other units of the University. The student is advised to prepare for one major area of concentration and one minor professional area. Some of these areas are: teacher of industrial arts (called Enterprise: Man and Technology), of trades and industries, of technical teaching, or of health occupations; coordinator of cooperative occupational education programs; and supervisor, director, or administrator of secondary, area vocational, community junior college, or other vocational-technical or occupational educational programs.

Students with a bachelor's degree in science, technology, or engineering may qualify for advanced study which may involve technical subjects, study in work situations and educational institutions, and internship in teaching or other professional assignments.

Students may pursue the Doctor of Philosophy degree in education under the functional area of curriculum and instruction with advanced course work in technical and industrial education as determined by their program committee.

One-half or one-quarter time instructorships, teaching or research assistantships, and fellowships are available for qualified applicants. Additional information about programs, courses, instructorships, assistantships, and fellowships may be obtained from the chairman of the Department of Occupational Education.

Philosophy

The Department of Philosophy offers graduate work leading to the Master of Arts and Doctor of Philosophy degrees. Graduate courses in philosophy may be used also as a minor in programs leading to the Master of Arts or Master of Science in Education degrees. Students who do not plan to continue work in philosophy beyond the master's level are encouraged to elect a graduate minor or to combine philosophy with another subject in a 60-hour double major.

The department expects an applicant for admission to its graduate program to have had at least 24 hours' work in philosophy or closely related theoretical subjects, including at least one quarter in ethics, one in logic, and a year in the history of philosophy. The department may waive a portion of this credit requirement in favor of maturity and of quality and breadth of academic experience. The applicant will be required to make up serious background deficiencies by taking appropriate undergraduate philosophy courses without credit.

The Department of Philosophy requires the candidate for a master's degree to present a thesis, for which 9 hours of credit are allowed, and to complete a minimum of 39 additional hours of course work. He must pass two examinations: a written examination covering the nature and proffered solutions to the persistent problems of philosophy as dealt with by major philosophers from Thales to the present and an oral examination devoted chiefly to the thesis. In the written examination emphasis will be placed on such classical figures as Plato, Aristotle, Descartes, Spinoza, and Kant, but the student will be expected to answer questions involving at least two recent philosophers, one of whom will be an American.

A reading knowledge of one foreign language, usually French or German, must be demonstrated by passing the Doctor of Philosophy proficiency examination in that language.

Applicants for the Doctor of Philosophy degree in philosophy should submit with their application forms scores for the Graduate Record Examination. The department may, where other evidence of competence seems so to warrant, accept a candidate upon the condition that he later submit acceptable scores.

At the time of his acceptance in the program the student will be assigned an advisory committee who will help him plan a program of study designed to prepare him for admission to candidacy. After the student has accumulated at least 36 hours of credit beyond the master's degree, and before he begins work on the dissertation, he must take a written preliminary examination on the thought of one major figure in the history of philosophy and in the following four areas: history of philosophy; logic, methodology, and philosophy of science; metaphysics and theory of knowledge; and value studies.

Before he is allowed to take the preliminary examination the student must have met the research tool requirement in one of the following ways; (1) demonstrating a reading knowledge of two foreign languages by examination or by passing the appropriate 288c language course with a grade of *B* or better; (2) showing an appropriately higher proficiency in one language; or (3) demonstrating a reading knowledge of one foreign language and completing satisfactorily two or more courses at the graduate level in an outside area as approved by the student's committee.

After he has passed his language examinations and the preliminary examination and has completed 48 hours of work beyond the master's degree, the student is admitted to candidacy and assigned a doctoral dissertation committee which will supervise the research and writing leading to the dissertation. After the dissertation has been accepted by the committee, the student is given an oral examination on the dissertation and related topics.

The department has available each year a number of assistantships for qualified graduate students. Applications for these assistantships should be sent to the department before February 15 of the academic year preceding that for which the application is made. An effort is made to give every candidate for the doctor's degree supervised experience in teaching elementary work in the field of philosophy.

Physical Education

Graduate courses in physical education may be taken as a major or minor

toward the Master of Science in Education degree or the Doctor of Philosophy degree in education. The number of hours required in physical education at the master's level is 32 for a major or 16 for a minor.

Master's Degree

The departmental requirements for unconditional admission as a master's degree candidate are:

1. Fulfillment of the requirements for admission to the Graduate School.
2. Presentation of at least the equivalent of an undergraduate minor (preferably a major) in physical education.
3. Presentation of at least one undergraduate course in kinesiology and at least one in educational psychology or psychology of the particular field of the student's specialty.
4. Possession of the ability to teach and demonstrate an acceptable variety of skills and techniques in physical education activity.

A student may be conditionally admitted to the program and may be permitted to do graduate course work while he removes deficiencies.

Requests for transfer of credits from other institutions will be considered only before admittance into this program.

Minor

Students with a major in a related area may take a minor in physical education. This consists of 16 hours chosen from one of the areas of concentration in consultation with a physical education adviser.

Requirements

The Department of Physical Education offers programs in several areas. Core courses common to all specialties are P.E. 500, 503, and either 504 or 599. The courses are designed to provide common experiences to all students regardless of their specialization.

Area of Specializations

1. The Experimental Physical Education Program

This program is intended to prepare students to enter advanced study and to perform scholarly research which emphasizes depth in a selected science. A student, in conference with his adviser, designs a program which satisfies his special interest.

2. The Professional Physical Education Program

This program is designed to develop a high level of competency in teaching physical education in colleges, secondary, and elementary schools. The student, in conference with his adviser, designs a program which satisfies his special interest.

3. The Applied Physical Education Program

The purpose of this program is to prepare coaches of athletic teams to (1) increase their knowledge of fundamental principles which are basic to the coaching and administration of athletics and (2) to develop a broad perspective of the role of athletics in the total educational environment.

Doctor of Philosophy Degree

One may pursue a program of study leading to a Doctor of Philosophy degree in education through the functional area of curriculum and instruction.

The department qualifications for admission to advanced graduate study are:

1. Fulfillment of the requirements of the Graduate School and the College of Education.

2. Presentation of professional course work equivalent to the University's undergraduate and master's programs in physical education.

A student may be permitted to start advanced graduate work while making up deficiencies.

Three years of full-time graduate study after obtaining a bachelor's degree or two years of full-time graduate study after a master's degree (or its equivalent) constitute the minimum requirement for the doctorate. The student and his adviser will determine a pattern of course work to equip the student in physical education and its allied fields, foundations of education, cultural courses outside the area of education, and for independent research.

The program of studies beyond the master's degree must contain a majority of course work at the 500 level or above, as well as a required departmental core of 12 hours. Included in his study are all general requirements of the functional area.

The procedure for beginning a program of study leading to a Doctor of Philosophy degree is as follows:

1. Submit an application for admission, with transcript or transcripts, to the Graduate School.

2. Apply for admission to the Department of Physical Education as well as to the appropriate functional area.

3. If admitted, the coordinator of the functional area will arrange for proper counseling and programming in the field of specialization.

Physics

Graduate work in physics may be taken leading to the Master of Arts and Master of Science degrees, and the Doctor of Philosophy in molecular science. Graduate courses in physics may also be taken as part of a physical sciences program toward the Master of Science in Education degree.

In addition to the general requirements of the Graduate School there are other specific requirements for the master's degrees in physics as follows:

The following courses are specifically required for both M.A. and M.S. degrees: Physics 511 (or mathematics equivalent), Physics 510 (a and b only), and Physics 530.

Master of Arts Degree

This program is designed primarily for those entering the molecular science Ph.D. program. The M.A. degree is not a requirement of the molecular science Ph.D. but may be taken if desired by the student. A reading knowledge is required in French, German, or Russian as demonstrated by passing one of the Educational Testing Service's Graduate Foreign Language Examinations, administered by the University Counseling and Testing Center once each quarter. The M.A. in physics will be granted on the basis of a research paper and 33 quarter hours of course work at the 500 level. Each candidate for an M.A. degree is required to pass an examination, written or oral or both, covering his graduate work

including the research paper. This examination is given by the student's advisory committee.

Master of Science Degree

This program is specifically designed for those who wish a professional degree and do not plan to continue beyond the master's level. A reading knowledge of a foreign language or demonstrated competence of computer skill is required. This requirement can be met by passing one of the Educational Testing Service's Graduate Foreign Language Examinations (administered by the University Counseling and Testing Center once each quarter, in the case of language), or a similar examination for testing computer skill. English can be substituted for either of the above requirements at the discretion of the graduate advisor provided it is not the native tongue of the candidate. A thesis is required, based upon not more than nine or less than five quarter hours of 599 level effort. This may be included in the minimum 24 hour requirement of course work at the 500 level as stated in this catalog. This should be distributed preferably over several quarters of enrollment. Each candidate for an M.S. degree is required to pass an examination, written or oral or both, covering his graduate work including the thesis. This examination is given by the student's advisory committee.

Doctor of Philosophy Degree

The doctoral program is within a University-wide framework of molecular science with a core in theoretical and applied physics. See molecular science description for specific details. The physics program is a flexible one, designed to give the student a background in depth in the general principles and techniques of modern physical theory and at the same time to satisfy his individual interests and needs. Properly qualified graduate students from the areas of the physical sciences, life sciences, engineering, and mathematics are invited to apply for advanced study where the student's interests may be interdisciplinary with physics; e.g., biophysics, chemical physics, geophysics, materials science, and mathematical physics. One research emphasis in the department is in the general field of molecular physics; dissertation topics in this field include studies of motional, structural, electrical, and magnetic properties encountered in liquid, surface, and large molecule physics. Theoretical research in such areas as electromagnetic theory, thermodynamics, statistical, and quantum mechanics is being tempered to a considerable degree by the directions taken in the experimental aspects of the molecular science program.

Physiology

Graduate courses in physiology may be taken leading to the Master of Arts and Doctor of Philosophy degrees. Graduate courses in physiology also may contribute to a major in biological sciences toward the Master of Science degree, and to one in biological sciences in education toward the Master of Science in Education degree.

The Graduate Record Examination must be taken before admission to the graduate program for doctoral students, and it is prerequisite to graduation for master's students.

The graduate prerequisites at the master's level usually include the equivalent of an undergraduate major in biological sciences plus inorganic,

analytic, and organic chemistry and a minimum of one year each of physics and mathematics. Students with majors in related areas such as chemistry, physics, mathematics, psychology, or engineering are also encouraged.

For a master's degree in physiology, a student must ordinarily obtain a minimum of 48 hours graduate credit and present an acceptable thesis based upon original investigation. Equivalent work completed elsewhere can be accepted in part. Students are encouraged but not required to attain competence in one research tool.

A minor is not required for a master's degree in physiology. However, a student may elect to obtain a minor in another area of biological science, or in chemistry, or physics, upon consultation with his advisory committee.

Training is provided in cellular, comparative, and mammalian physiology, pharmacology, human anatomy, electron microscopy, and biophysics. Entering students are urged first to obtain a basic knowledge of the whole field and then to specialize after being advised by the chairman of the department or departmental graduate adviser.

Students entering the doctoral program should ordinarily have at least the same prerequisites as those entering a master's program, except that courses in calculus and physical chemistry are highly recommended. Students with prior major concentrations in chemistry, physics, or engineering, but little training in biological sciences, are equally eligible for admission to the program.

A competence in two of the prevailing research tools plus a written qualifying examination are necessary for admission to doctoral candidacy.

The total program must be provisionally formulated upon entrance, and evaluated periodically thereafter, in consultation with the chairman of the department or the major adviser, and the advisory committee.

Three years of full-time graduate study after obtaining the bachelor's degree, or two years after the master's degree (or its equivalent) usually constitute the minimum requirements for the doctorate. A dissertation is required and also a final oral examination.

Plant Industries

The department offers the Master of Science degree with specialization in the areas of crop science, soil science, and horticultural science. Requirements for admission are the same as for the Graduate School, but students with a bachelor's degree in other fields will be required to meet the department's undergraduate requirements.

The Master of Science degree requires a minimum of 48 quarter hours. There is no foreign language requirement. A thesis is ordinarily required, but a student may elect a nonthesis option with the approval of his committee.

It is customary to require supporting courses in botany, microbiology, chemistry, statistics, and other areas essential to a problem in the student's chosen field and to prepare him for acceptance for the Doctor of Philosophy degree if he has that potential. Once the general field has been selected, the research and thesis may be completed in any one of the many divisions of that field. In horticulture, for example, the research and thesis may be in vegetables, tree-fruits, small-fruits, ornamental plants, or turf management; in soils, the problem may relate to fertility, soil physics, soil microbiology, soil chemistry, or soil and water conserva-

tion; in field crops, the problem may be directed toward crop production and management, weeds and pest control, or plant breeding and genetics. Often two of these more restricted areas can be combined in one problem. A final oral examination is required covering both the student's course work and his thesis problem.

For additional information about the program or graduate assistantships in the department; contact the department's graduate adviser, Room 176, Agriculture Building.

Psychology

The Department of Psychology offers graduate work leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees in the following areas: experimental psychology, counseling and clinical psychology. The primary emphasis is on doctoral training, for which the master's degree is a prerequisite.

In addition to academic requirements, doctoral students in the clinical and counseling areas must complete the equivalent of a full-time academic year of internship in an agency approved by the department.

Separate application forms for both the Department of Psychology and the Graduate School must be submitted. Students will be accepted for graduate work in psychology only upon approval by the departmental admissions committee as well as the graduate school office. Departmental application forms may be obtained from the chairman, Department of Psychology. Graduate School application forms may be obtained from the Graduate School.

It is apparent that psychologists are faced with demands to deal with an ever-increasing range of problems, basic as well as applied. As a consequence, the goal of graduate study at Southern Illinois University is to develop psychologists who will have a broad perspective and scientific sophistication, as well as the requisite skills to advance the field of psychology and meet changing needs. To accomplish this aim, a program composed of four integral parts has been developed: the core curriculum, specialization, research and practicum opportunities, and training assignments.

Core Curriculum

The core curriculum is designed to give systematic work in both the theoretical and substantive material of general psychology, and yet to allow for flexibility in individual program planning. During the first year all students are required to take a three course sequence in quantitative methods and research design. In addition, by the end of the second year, through a series of elective options six additional courses in areas other than the major are required to provide breadth as well as some degree of depth in the total field of psychology.

Areas of Specialization

EXPERIMENTAL PSYCHOLOGY

The general-experimental program is planned for the student who wishes to have a broad academic course of advanced study in psychology together with intensive specialization in one area of experimental psychology. It is primarily intended for students working towards careers in teaching and research. While considerable flexibility is permitted so that

the student may select courses from several areas, he is expected to concentrate in at least one area of experimental psychology: learning, sensory processes, social, developmental, physiological, personality, quantitative. The following courses are required: 510, 526, and 509. In addition, the student is required to take research credit during all but the first three quarters of residence.

CLINICAL PSYCHOLOGY

The clinical psychology program, approved by the Education and Training Board of the American Psychological Association, provides training such that the student may prepare for a career in clinical activities, research, or teaching. Students are expected to have experience in at least two of these activities by graduation. Two types of programs are available: (a) general clinical in which 39–41 hours are required for a major (530, 537, 541, 531, 543a and b, 593e–9, 595 (all but first quarter of residence), 598 and electives; and (b) experimental clinical for those who plan careers primarily in research in which 39–41 hours are required for the major (530, 537, 541, 531, 523, 593e–3, 509, 595 (all but first quarter of residence), 598 and electives.

COUNSELING PSYCHOLOGY

The counseling psychology program, approved by the Education and Training Board of the American Psychological Association, is designed to prepare students for college and university positions, hospital positions, or positions in social agencies. Students are expected to develop competencies in research and teaching as well as in counseling and other psychological services. The required courses are: 523, 530, 536, 537, 541, 547, 593f–9, and 598. In addition, the following electives are recommended: 531, 538, 539, and 543.

Research and Practicum

Because of our commitment to the importance of broadening the scientific base of psychology and to the development of skills in the application or teaching of psychological principles, a variety of research and practicum experiences is considered an integral part of the student's training. Therefore, with the exception of the first quarter, the student is expected to participate in research or practicum each quarter of residence.

Research may be of the student's own design or may be in conjunction with various studies being conducted by staff members. Research competence in original individual research is required of all students in either case.

Training Assignments

As a vital part of our graduate training program, each student must be engaged in a training assignment each term. These assignments vary according to the needs and professional aspirations of the student. They are designed to supplement the formal course work by a variety of pre-professional activities such as research and teaching, under staff supervision. The training assignment increases in responsibility as the student progresses. The amount of time required of the student varies from 10 to 20 hours a week, depending upon his level of progress, the type of assignment, etc. The purpose of these assignments is to expose the student to some of the types of activities that he will ultimately be engaged in

after he receives his degree. Performance on these assignments is evaluated and is considered along with course grades in recommendations for advanced degrees.

Recreation

The Department of Recreation offers a broad interdisciplinary, interdepartmental program of study leading to the Master of Science in Education degree. The curriculum is designed to prepare professional leadership for the supervision, management, and administration of recreation wherever it is needed.

All students admitted to the master's program are expected to complete: 1) The core of professional courses: Recreation 500, 520, 530, 540, 570, Education Administration and Foundations 500, and Management 440; 2) sixteen quarter hours in their chosen option; and 3) A thesis, or internship of one year and a research paper.

Park and Community Recreation

The greatest need for recreation leadership is in the local community. It is here that recreation under governmental, voluntary, industrial, educational, religious, and private auspices takes its roots. This area of specialization prepares the student for administrative and supervisory positions in municipal recreation and park commissions, park districts, public schools, private agencies, military and industrial complexes, and student unions.

Recreation for Special Populations

Organized recreation programs for special groups are becoming increasingly important to hospitals, nursing homes, schools for the retarded, golden age clubs, prisons, and other institutions. Community recreation departments are offering programs for special populations for those who remain in the community.

Commercial Recreation Management

Commercial recreation is mushrooming throughout the country, bringing an unprecedented demand for leadership in the management of such establishments as resorts, country clubs, marinas, tourist attractions, and public and private assembly facilities such as convention halls, civic and community centers, auditoriums, and arenas.

Outdoor Recreation

There is an increasing need for professional recreation personnel who can manage and administer recreation activities and programs under natural conditions. Camp executives, counselors, conservationists, naturalists, and leaders are needed for an increasing number of programs related to outdoor recreation. Students interested in outdoor recreation resource management should contact the Department of Forestry for admission requirements and further information regarding this program.

Rehabilitation

In response to pressing human and social needs, the applied field of rehabilitation has solidly entrenched itself as a professional discipline

over the past twenty years. Multidisciplinary courses of study have been drawn together from the behavioral, social, and medical sciences appropriate to the development of competent practitioners and programmers in rehabilitation and welfare agencies. The overall program is left purposely broad and flexible to permit the inclusion of training innovations and emerging career patterns.

The Rehabilitation Institute offers graduate programs leading to a Master of Arts or a Master of Science degree in behavior modification and rehabilitation counseling. Each degree requires a minimum of 72 quarter hours of course work and field experience. The distinction between the awarding of M.A. and M.S. degrees in these programs will be made on the basis of demonstrable research performance. The M.S. degree students will concentrate primarily on preparation for entry into the helping, professional fields, and ordinarily they will complete a project or research paper in their area of specialization. The M.A. degree will be awarded only when a student elects to accomplish a research project of an experimental nature involving demonstration of the abilities to formulate research questions, appropriately manipulate experimental variables, and formalize an analysis of data so obtained. An M.S. degree in rehabilitation administration may be obtained by the successful completion of a minimum of 48 credit hours of course work and field experience.

These concentrations are sufficiently open to permit a student to emphasize work with a particular population such as the emotionally disturbed, correctional wards, mentally retarded, physically handicapped, economically deprived, or others. The graduate may work in such settings as state-federal vocational rehabilitation programs, clinics, hospitals, workshops, correctional centers, youth camps, or employment service offices. Some degree programs also require the completion of a three- to six-month internship in an approved agency or institution.

Application forms for both the Graduate School and the Rehabilitation Institute must be separately submitted. Forms for the former may be obtained from the Graduate School and institute forms may be obtained from the director, Rehabilitation Institute. Acceptance in the program is contingent on the final approval of the admissions committee of the Rehabilitation Institute after processing by the Graduate School.

Rehabilitation Counseling

This is a six-quarter (72 hours of credit) graduate program leading to either the Master of Arts or Master of Science degree. The trained professional counselor must demonstrate competence in establishing a counseling relationship, case evaluation, assessment procedures, program planning and coordination, and vocational placement, as well as have an awareness of professional and community resources that can be utilized in the rehabilitation process. Required courses: 480, 511, 519, 532, 541, 551, 556, and 561. The student will also be given quarterly field work assignments (585c) and must complete a full quarter internship in a rehabilitation setting. Completion of a terminal project, research paper, or experimental research project is required depending on the degree selected by the student.

There is sufficient flexibility in the curriculum so that special interests and needs of students can be pursued by careful selection of electives. Some suggested electives include personality dynamics, social psychology,

community development, group processes, educational psychology, economic deprivation, and processes in social work. A special plan of study and field experience is available for students emphasizing rehabilitation in the area of crime and corrections or the mentally retarded. Comprehensive examinations are satisfied through oral examination by the student's advisory committee.

Behavior Modification

The behavior modification major is designed to train students in the application and evaluation of techniques which have demonstrable utility in the modification and development of human behavior. Empirical principles derived from functionally established relationships in human behavior are translated into practical technological tools.

Within this framework, students may specialize in environmental programming and direct service with such broad groups as the mentally retarded, mentally disordered, slow learners and problem children, and in specific problem areas such as incentive programs for job training, learning disabilities, stuttering, cigarette smoking, sexual behavior, and language development.

Candidates in the behavior modification program elect to pursue either the M.A. or M.S. degree, and depending on the degree selected complete as a terminal requirement a project, research paper, or experimental research project. Both degree programs require the completion of 72 credit hours combined from substantive, laboratory, and practical experience areas. Course programs are tailored to fit the needs and interests of individual students. Most students will enroll in a first-year course sequence which includes Rehabilitation 485, 520, 526, 533, 535, and 563. Further course work may include substantive areas such as sexual behavior, child behavior, programmed instruction, and electives from other departments. All students participate in a one-quarter full-time internship at an affiliated training center. Comprehensive examinations are satisfied through oral examination by the student's advisory committee.

Rehabilitation Administration

The design of this major is to prepare generalists to serve as administrators, coordinators, supervisors, and programmers in such rehabilitation settings as workshops, clinics, special schools, youth centers, and state agencies. Requirements for the M.S. degree are a minimum of 48 quarter hours of course work and field experience, at least one quarter of full-time internship and a research paper. The internship may be waived for the candidate who already has a wide range of experiences in rehabilitation or welfare agencies.

Candidates will develop competencies in program planning and development, organization and administration of service/training units, and in staff development and supervision. Specific course requirements are Rehabilitation 480, 501, 551, 556, 561, and 585a. Select courses in the Departments of Management and Marketing are also strongly recommended. Comprehensive examinations are satisfied through oral examination by the student's advisory committee.

Secondary Education

The Department of Secondary Education offers programs leading to the Master of Science in Education degree and the Sixth-Year Specialist's

Certificate. In addition, the department offers courses that are applicable to the Doctor of Philosophy degree in curriculum and instruction.

The master's degree in secondary education is planned jointly by the Department of Secondary Education and the department of the student's teaching field. Required for unconditional admission to the master's program are a 3.7 overall undergraduate average, the successful completion of at least eight quarter hours of student teaching, enough professional education hours to meet requirements for a secondary school teaching certificate, and a major in the teaching field. A program of 48 quarter hours will be planned to include a research requirement and at least two graduate level courses in Secondary Education. The student will take 24 to 32 hours of graduate work in his teaching field and 16 to 24 hours of graduate work in education. During the period the student is taking his last twelve hours of work, a comprehensive oral or written examination will be administered by the department.

The department offers a Sixth-Year Specialist program for experienced teachers and other personnel in the secondary school. The specialist program is regarded as terminal in nature and not as a step toward the doctorate. Applicants for admission to the Sixth-Year Specialist program should possess a master's degree, or its equivalent, two years of successful teaching experience, and an acceptable score on the Cooperative English test. To obtain the Sixth-Year Certificate the student must complete 96 hours of graduate work beyond the bachelor's degree. At least half of the minimum hours required shall be in secondary education and supporting professional areas. Forty hours of the 96 shall be from disciplines outside of education. A field study or internship is a required part of the program.

Secondary education participates in the doctoral program in education in the functional area of curriculum and instruction. Students interested in secondary education may pursue an equivalent of a major concentration within the area program. For additional information on the Ph.D. see the preceding section entitled Education. Inquiries regarding the Ph.D. with emphasis in secondary education should be addressed to the coordinator of the area of curriculum and instruction in the College of Education.

Secretarial and Business Education

General Information

Graduate courses in business teacher education may be taken as a major in the Department of Secretarial and Business Education leading to the Master of Science in Education degree.

The graduate program is planned for those students who have an adequate subject-matter background in at least one of the following business teaching areas: (1) secretarial, (2) general business or consumer education, (3) bookkeeping and accounting, (4) distributive education, or (5) data processing. Deficiencies in background, if any, must be eliminated by taking appropriate courses.

Master's Degree

The program is aimed at upgrading and making more proficient those individuals who have already met or surpassed the minimum requirements for teaching business subjects in the high school, junior college, or other type of educational institution offering business education curricula.

The major in business teacher education consists of a minimum of 48 quarter hours of course work distributed as follows:

1. Eighteen or more hours in business teacher education courses, such as: improvement of instruction in the secretarial subjects, teaching consumer education, principles and problems of business education, research in business education, and organization and administration of cooperative vocational business education. Twenty-one different courses in this area are available. A minimum of two of the following courses is required: 500, 502, 503, 508, 509, 510.

2. Twelve or more hours in business administration, office administration, and economics courses offered by the following departments of the School of Business: Accounting, Economics, Finance, Management, Marketing, and Secretarial and Business Education.

3. Twelve or more hours in courses offered by the various departments of the College of Education.

Each student's program is tailored to meet his particular needs and interests.

In keeping with the general requirements of the Graduate School, each student is required to conduct an investigation and write a research report. Those who have special interest and ability in research or who expect to go on to advanced graduate study are encouraged to write a thesis.

The passing of a final written examination is required at the end of the program.

Sixth-year Specialist's and Ph.D. Programs: Two advanced graduate programs for business teachers who hold the master's degree or its equivalent, each providing for a concentration of study in business education, are offered. They are the specialist's program in secondary education and the doctoral program in the functional areas of curriculum and instruction. Both programs are operated under the jurisdiction and within the organization of the Graduate School and the College of Education.

Sociology

The Department of Sociology offers programs of graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The department ordinarily requires a grade point average of at least 4.0 for admission to the master's degree program and a minimum grade point average of 4.5 for admission to the Doctor of Philosophy degree program. Graduate Record Examination scores on both the aptitude and the advanced (sociology) sections must be submitted with the application for admission.

A minimum of 48 course hours is required for the master's degree. There are no specific course requirements, but the student must pass a comprehensive written examination covering major areas of the discipline. A thesis or a research paper is required to complete requirements for the degree.

Several areas of major or minor concentration are provided for advanced work beyond the general master's program. These are: theory-methodology; social disorganization, deviance, and control; social organization; social psychology; sociology of the family. There are no minimum course hour requirements, specific course requirements, or research tool requirements for the Doctor of Philosophy degree. A diagnostic examination is given in the fall and spring quarters, and students are required to take

this examination the first time it is offered following their entrance into the Doctor of Philosophy program. To attain the status of candidate for the Doctor of Philosophy degree, the student must pass a comprehensive written examination in two major (one in theory-methodology) and two minor areas. A dissertation is required to complete requirements for the degree. After approval of the dissertation by the candidate's dissertation committee, an oral examination, primarily on the content and implications of the dissertation, is scheduled and conducted by the committee in open meeting.

Applicants for admission to graduate study in sociology should apply in writing to the chairman of the department. Detailed statements of departmental requirements for the Master of Arts and the Doctor of Philosophy degrees are available upon request. Additional information on programs may be obtained from the departmental director of graduate studies.

Special Education

Several programs leading to a Master of Science in Education degree are offered by the Department of Special Education. Courses which lead to certification as a teacher of exceptional children may be included in the master's degree program. This training is specifically designed for individuals who have had successful teaching experience in regular classrooms and who wish to qualify as teachers of mentally retarded, emotionally disturbed, or learning disabled children.

For persons holding certification in some area of teaching exceptional children, a program designed to meet the requirements for special education administrative positions is offered. This is a program which is flexible enough to meet the needs of persons with a background in any one of a variety of special education areas.

A Sixth-Year Specialist's certificate program in special education with emphasis on one or more areas, including special education supervision, is available.

Finally, building on the core requirements of the functional areas of educational psychology, administration and social and philosophical foundations, and curriculum and instruction, a Doctor of Philosophy degree in education with an emphasis in special education is offered. This program has its base in the requirements indicated in the respective functional area. Specific course requirements for the emphasis in special education include extensive seminar experiences in the study of all types of exceptional children.

A number of graduate fellowships, both at the master's and doctoral level, under Public Law 91-230 are available to qualified persons seeking careers in special education through study in this department.

All special education doctoral students are required to work in departmental teaching or research activities for a minimum of four clock hours per week during each term of their full time enrollment. A total of four to eight hours of academic credit is granted for these practicum activities. The purpose of this requirement is to provide an opportunity for the doctoral student to participate in progressively more responsible professional activities under the supervision of the departmental faculty.

Speech

Courses are offered in speech leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. The Master of Arts and Master of Science degrees are offered with specialization in interpersonal communication, interpretation, rhetoric and public address, speech education, and general speech. Courses in speech may be taken as a part of the program leading to the Master of Science in Education degree. The Doctor of Philosophy degree is offered with specialization in interpersonal communication, interpretation, rhetoric and public address, speech education, and theatre.

Master's Degree Programs

The student should submit the equivalent of an undergraduate major in speech in order to be admitted unconditionally as a full-time graduate student for the master's degree. However, the student may petition the Graduate Committee to determine if his background is adequate for the specialization desired.

The program of course work leading to the master's degree includes areas and techniques of research and a seminar in the area of emphasis. A total of 48 hours is required for the degree. At least 24 hours must be earned in courses numbered 500 or above. A student must maintain an overall 4.0 grade point average in order to be eligible for the master's degree. Competence in one foreign language is required for the Master of Arts degree.

The research requirement for the master's degree may be met by either of the following plans:

Plan 1

1. Submit a thesis demonstrating ability to do research on a topic approved by the graduate committee of the Department of Speech.
2. Take a minimum of 39 hours of course work.
3. Pass an oral examination over the thesis and course work.

Plan 2

1. Submit a research paper as evidence of a knowledge of formal research techniques, a copy of which will be submitted to the Graduate School for its permanent records.
2. Take a minimum of 48 hours of course work.
3. Take a comprehensive written examination over the course work taken for the degree.

The student will be given a choice as to which of the above plans he wishes to take; however, the graduate committee of the Department of Speech will make the final determination as to which requirement the student must meet.

Doctor of Philosophy Degree

Each student shall demonstrate competence in at least two of five areas: interpersonal communication, interpretation, rhetoric and public address, speech education, and theater.

Program

The program should include at least 32 hours in the major area of competence and 16 hours in the minor area of competence. The minor area of competence may be outside the Departments of Speech and Theatre but approval must be obtained from the student's advisory committee and the graduate committee. The proposed program must meet the Graduate School requirements for residence, and shall exclude course work designed to meet the research tool requirement. Any change in the program must have prior approval of the student's Advisory Committee.

After completing 24 quarter hours of his program each student shall be reviewed by the graduate committee to determine continuation, change or termination of the program. The advisory committee for each student shall be responsible for assembling the necessary information (grades, recommendations, progress in tool requirements, etc.) for consideration in reaching the above decision.

The student must maintain a 4.25 grade point average in both major and minor areas of competence throughout his program of study. If the grade average in either area of competence drops below 4.25, the student is placed on academic warning for the following two quarters or until the grade average is returned to 4.25, whichever ever occurs first.

Advisory Committee

An advisory committee shall be established during the first quarter of graduate study to plan the program of study with each student. The committee shall be composed of two professors from the major area of competence and one professor from the minor area of competence. The chairman of the committee shall act as the primary adviser and sign the graduate course requests form. This advisory committee is responsible for certifying to the graduate committee that the student has met all departmental requirements for admission to candidacy and has passed the Ph.D. preliminary examination.

Research Tool

Before admission to candidacy the student must demonstrate competence in one research tool. This shall embody skills needed in understanding materials in the field, or in the conduct of research for the dissertation, or in continuing research contributions in his field of specialization.

Competency may be achieved in a language, statistics, computer programming, or, in some cases, the completion of twelve hours of additional course work outside the Department of Speech.

Twelve hours of work in statistics with an average grade of 4.0, plus the completion of a research project in the Department of Speech usually will be considered a demonstration of competency in statistics. In some cases, the final examination of the third quarter of the statistics sequence plus the research project will indicate the student's competency.

For the foreign language tool requirement, proficiency usually will be determined by an E.T.S. examination. A research project utilizing the foreign language to demonstrate competency must be completed in the Department of Speech.

Computer programming may be utilized when the student is interested in conducting quantitative research. This research may be for the dissertation or some other research project. Competency will be determined by the completion of a research project in the Department of Speech. In

some cases, a student may satisfy the research tool requirement through the completion of twelve hours of additional course work outside the Department of Speech, the courses determined and approved by the graduate committee after the student's dissertation topic has been approved by the advisory committee. A 4.0 average will be required for the courses. Final approval will be contingent on the successful completion of a preliminary research project germane to the dissertation topic utilizing the courses selected to meet the tool requirement.

Preliminary Examinations

The student must pass preliminary examinations over the two areas of competence, the preparation and administration of which is determined by the advisory committee in consultation with the student. The examination may be taken after completion of the course work, and prior to completion of the research tool requirement, upon unanimous approval of the advisory committee.

Dissertation

The dissertation committee shall be responsible for approving the prospectus and the dissertation director, supervising the dissertation, and administering the final oral examination.

Speech Pathology and Audiology

The Department of Speech Pathology and Audiology has as its objective the training of personnel for communication science research, for college and university teaching, and for the diagnosis and treatment of persons with speech and hearing impairments. Course work leads to certification as a speech pathologist or audiologist in public schools and rehabilitation centers by meeting certification requirements of the American Speech and Hearing Association. Its program in clinical training is approved and registered with the Education and Training Board of the American Board of Examiners in Speech Pathology.

Professional experiences for graduate students are provided in the following settings: the University's Clinical Center; a summer residential camping program for persons with organic speech problems, in cooperation with the University of Illinois Division of Services for Crippled Children; the V.A. Hospital in Marion; A. L. Bowen Center for Retarded Children; and the Anna State Hospital. Cooperative programming is maintained with other public and private agencies such as the Division of Vocational Rehabilitation, the Easter Seal Society, and the National Association of Speech and Hearing Agencies. Students participate in traveling speech and hearing clinics which serve schools and communities through the media of surveys, diagnostic examinations, and therapy. The department has available R.S.A. traineeships, N.D.E.A. fellowships for support of graduate education in addition to graduate and research assistantships. Students can also apply for the special doctoral assistantships and graduate fellowships available from the Graduate School through the department.

Specialized experiences with orthodontists, prosthodontists, plastic surgeons, otologists, and others of the medical and dental professions are available in the St. Louis and Chicago areas. Emphasis is on the interdisciplinary relationships with other professions throughout the training process.

The department maintains active research facilities which provide laboratories and specialized equipment for the study of both the normal and impaired functions of the speech and hearing processes and their relationship to language formulation. The speech science laboratory is equipped for electromyographic study of the speech musculature, radio telemetry, electrophysiology of hearing, and spectrographic analysis of speech signals. The experimental audiology laboratory, which includes an anechoic chamber, is equipped for investigation in air and bone conduction sensitivity, localization, and speech discrimination. It also has facilities for automatic audiometry, PGSR, middle ear impedance, and aural reflex experimentation. Facilities are also available for the use of palmar sweat measurements as a physiological index of emotion, for the study of pathoanatomy and pathophysiology of cleft lip and cleft palate through roentgenocephalometrics and cinefluoroscopy, and for the experimental analysis of behavior and behavior modification.

Graduate courses in the Department of Speech Pathology and Audiology may be taken for a major leading to the Master of Science and Doctor of Philosophy degrees.

G.R.E. aptitude test scores should be submitted to the department. They are not mandatory for admission, however, and may be submitted shortly after admission, usually within the first quarter of residence.

Additional information regarding financial aid, programs, and application procedures can be secured by writing to the chairman, Department of Speech Pathology and Audiology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901.

Master's Degree

The master's degree requires a minimum of 48 hours of acceptable graduate credit (4.0 average) at least 24 quarter hours of which are of the 500 level, and the completion of an approved thesis or research paper. Specific course requirements and total number of hours are determined by advisement after consultation with the graduate student. A comprehensive examination over course work may be given by the faculty three quarters after the beginning of full time work for purposes of advisement and assessment of student's academic status.

It is recommended that the master's degree culminate in the academic and practicum requirements for the Certificate of Clinical Competence in Speech Pathology or Audiology as designated by the American Speech and Hearing Association.

A candidate for the master's degree has two options: to write a thesis, or a research paper. The thesis may be counted for not more than 9 nor less than 5 quarter hours of credit. A research paper should show evidence of the student's knowledge of research techniques and should be based on a special project or specific courses as may be recommended by the adviser. All students intending to pursue doctoral studies are encouraged to write a thesis. If the student plans to continue at Southern Illinois University, it is mandatory.

Doctor of Philosophy Degree

The student, after consultation with his academic adviser, is expected to propose to the graduate faculty of the department the academic program he intends to pursue prior to taking the preliminary examination for admission to candidacy. The proposed program must meet the Graduate

School requirements for residence, and shall exclude course work designed to meet the research tool requirement. The program must also include a cognate area which will assure a meaningful competence in subject matter outside the student's major department. Graduate faculty approval of the proposal signifies an agreement between the student and the department.

After satisfactory completion of the above, the student may request the preliminary examination. The preliminary examination shall be written and administered by no fewer than 5 graduate faculty members representing the student's specialization, cognate, and research interests. Should the student fail the first examination, he may, with faculty approval, repeat the examination once within a 12-month period.

After successful completion of the approved academic program, research tool, and the preliminary examination, the student will be admitted to candidacy for the degree. The candidate must then complete a dissertation showing that he is capable of independent research.

The final examination shall be oral and cover the subject of the candidate's dissertation and related academic and professional matters.

Research tool

a. The research tool shall replace neither a required nor a prerequisite element of the student's proposed academic program and must be completed before the student will be permitted to take the preliminary examination for admission to candidacy.

b. The student must demonstrate an ability to deal with descriptive and inferential statistics and research design techniques. Ordinarily this will be accomplished by completing a three-course sequence (12 quarter hours) in statistics, such as the sequence available in the Department of Guidance and Educational Psychology. Competency will be demonstrated by achieving a *B* average in the course sequence, or by proficiency. The sequence should be considered to be outside of any specific degree requirement.

Theater

The Department of Theater offers courses leading to the Master of Arts and Master of Science degrees and to the Doctor of Philosophy degree in speech with a specialization in theater.

Candidates for the master's degrees must complete 48 hours of graduate credit; the Master of Arts candidate must demonstrate competence by one project relevant to either 1) professional skills or 2) a research area. Candidates, after admission to the program, are sent a required reading list of plays on which a diagnostic test is given during the first quarter of residency. The test also requires the writing of an essay selected from a list of topics in the field. Each candidate for the master's degree will produce a thesis or its equivalent (creative work in play direction, costume or scene design, or playwriting). The chairman appoints a director for each candidate's program. The Doctor of Philosophy degree program in speech with a specialization in theater is open to students holding a master's degree. Doctor of Philosophy degree candidates are required (1) to complete a minimum of 32 hours in theater and 16 hours in speech; and (2) to complete a theater dissertation. Qualified candidates may offer a creative equivalent in producing, playwriting, or design, under the supervision of an advisory committee. Candidates for the Doctor of Philosophy

degree with a major concentration in theater must demonstrate competence in one research tool (refer to speech for description) relevant to skills needed for understanding materials in the field, or in the conduct of research for the dissertation, or in continuing research contributions in the field of specialization. Competence may be achieved in a language, statistics, computer programming, or in another area as determined by a committee composed of one professor from each area of emphasis. Candidates must also satisfy the graduate staff that they are qualified for candidacy by passing a comprehensive preliminary examination. Graduate courses in theater may also be taken as a secondary concentration leading to the Doctor of Philosophy degree in speech.

Candidates for the Doctor of Philosophy degree who have a special interest in dramatic literature may earn the degree by substituting a limited number of dramatic literature courses (approved by their adviser) as offered in the Department of English for theater courses.

An undergraduate major in theater is not essential for admission to candidacy for a graduate degree. A student with an undergraduate major in speech or English, for instance, may audit undergraduate courses in theater to make up any deficiencies.

Graduate students are urged to supplement their class work with practical experiences in acting and production. Membership in the Southern Players is open to graduate students, and they may also earn graduate credit as members of the Southern Touring Company and the Summer Stock Company.

Zoology

Graduate work in zoology may be taken as a major or minor toward the Master of Arts, Master of Science, and Doctor of Philosophy degrees. The departmental director of graduate studies should be consulted in regard to current programs, specific requirements, and individual questions. Graduate programs in zoology are as flexible as possible consistent with the goal of academic excellence.

Candidates for the Master of Science and Master of Arts degrees must have the consent of the department and at least 35 quarter hours of undergraduate credit in zoology. Credit in physical sciences and mathematics also is required. Deficiencies determined in undergraduate preparation may be removed concurrently with graduate work.

The Master of Science program is designed as a terminal degree; the Master of Arts as a predoctoral step.

The doctoral degree is a research oriented degree awarded for high accomplishment in a particular discipline or interdisciplinary area. Admission to the doctoral degree program in zoology ordinarily requires previous training in animal science. A good background in all life sciences, chemistry, mathematics, and physics is desirable. Each student's program of study is based upon the results of an advisory examination, the student's overall background, the requirements of the preliminary examination, and the proposed specialization. The student's adviser aids in the selection of a minor and establishes the program requirement. A dissertation demonstrating scholarly merit and the ability to perform independent research are required.

3 / Course Descriptions

Here are described all of the courses offered by Southern Illinois University at Carbondale for graduate credit. Courses are listed numerically within each subject-matter area. Areas are listed below in the order of their appearance on the following pages.

Accounting	Engineering	Journalism
Administration of Justice	Engineering Technology	Linguistics
Agricultural Industries	English	Management
Animal Industries	Family Economics and Management	Marketing
Anthropology	Finance	Mathematics
Applied Science	Food and Nutrition	Microbiology
Art	Foreign Languages	Music
Black American Studies	French	Occupational Education
Botany	German	Philosophy
Business Administration	Russian	Physical Education
Chemistry and Biochemistry	Spanish	Physics
Child and Family	Romance Philology	Physiology
Cinema and Photography	Forestry	Plant Industries
Clothing and Textiles	Geography	Psychology
Community Development	Geology	Recreation and Outdoor Education
Computer Science	Government	Rehabilitation
Conservation and Outdoor Education	Guidance and Educational Psychology	Secondary Education
Design	Health Education	Secretarial and Business Education
Economics	Higher Education	Sociology
Educational Administration and Foundations	History	Special Education
Elementary Education	Home and Family	Speech
	Home Economics Education	Speech Pathology and Audiology
	Instructional Materials	Theater
	Interior Design	Zoology

The first entry for each course is a three-digit numeral which serves to identify the course. Courses numbered 400–499 are open to both seniors and graduate students. Courses numbered above 499 are for graduate students only.

Following the course identification number is another number, which indicates the maximum credit allowed for the course. The maximum may vary, and specific quarter hours may be assigned for each quarter a course is given.

Following the course description there may be prerequisites which must be satisfied before a student is permitted to enroll.

To learn in which quarter a course is offered, the student should consult the Schedule of Classes, published quarterly by University Graphics and Publications, Southern Illinois University at Carbondale, Carbondale, Illinois 62901.

Accounting

410-4 Accounting Concepts. Interpretation and critical analysis of reports, statements, and other accounting data from the viewpoint of users of financial information. Restricted to graduate students.

415-4 Electronic Data Processing in Business. An introduction to computers and their uses in business applications; computer components, programming, and analysis of business systems; exploration of effects of computers upon business organization and society. Prerequisite: 251c.

422-4 Advanced Cost Accounting. Managerial decision-making, profit planning and control through direct and relevant costing, nonmanufacturing costs, return on investment and transfer pricing, capital budgeting, inventory models, subjective probabilities, statistical methods, and operations research. Prerequisite: 341.

453-4 Advanced Accounting. Accounting principles and procedures relating to specialized topics, including partnership equity, installment and consignment sales, fiduciaries, international operations, branches, and business combinations. Prerequisite: 351b.

455-4 Accounting for Public Organizations. Financial and managerial accounting concepts peculiar to the planning and administration of public and quasi-public organizations, such as governmental units, institutions, and charitable organizations. Includes the conventional budgetary-appropriation prices, as well as some of the more recent accounting developments related to public decision making. Prerequisite: 251b or equivalent.

456-4 Auditing. Objectives, standards, and procedures involved in examining and reporting on financial statements of business organizations. Prerequisite: 341 and 351b.

458-4 Accounting Systems. Accounting systems, design, and installation. Examination of existing systems and practice in systems design. Designing reports for management. Prerequisite: 341, 351b.

459-4 Internship in Accounting. Supervised work experience in professional accounting. Prerequisite: outstanding record in accounting and approval of department and firm.

461-4 C.P.A. and Advanced Accounting Problems. A course using problems from the American Institute of Certified Public Accountants' examinations given in recent years and supplementary problems from selected sources. Prerequisite: 341 and 351b.

475-4 Budgeting and Systems. Concepts, methods, and tools used in the design of management information systems. Techniques developed to identify problems in coordinating and controlling business activities. Prerequisite: 251b.

Administration of Justice

411-4 Critical Issues in Criminal Justice. Emergent phenomena in the system of criminal justice investigated to demonstrate the pertinence of theory to practice. Includes role conflicts in law enforcement and corrections, police professionalism, its place and function, the offender as a client for services, corrections as a setting for research, the juvenile court, and career patterns and difficulties.

416-4 Introduction to Research in Administration of Justice. Philosophy, theories, and methods of research. Principles of scientific inquiry contrasted with the constraints and demands of the criminal justice community. Prerequisite: consent of instructor.

417-4 Research Practicum in Administration of Justice. Review of alternative research models for measuring dispositional concepts. Interpretation of research. Construction and analysis of tools appropriate to some aspect of the administration of justice. Prerequisite: 416 or consent of instructor.

472-4 The American Correctional System. (See Sociology 472.) A survey of the correctional field, covering probation, institutional treatment, and parole. Historic development, organizational structure, program content, and current problems. Prerequisite: 372 or consent of instructor.

473-4 Juvenile Delinquency. Nature of juvenile delinquency; relationship to theories of deviant behavior; efforts at prevention and control. Prerequisite: two sociology or psychology courses or consent of instructor.

474-3 Law Enforcement Administration. (See Government 474.)

483-4 Current Problems in Corrections. An exploration of contemporary problems in the control and treatment of sentenced offenders and a review of research trends in corrections. Prerequisites: 472 and consent of instructor.

489a-4 Probation, Classification, and Parole. An introduction to the structure and function of those elements of the correctional process primarily concerned with the evaluation, treatment, and control of offenders with particular attention to the casework components of the process. Prerequisite: 481 or consent of instructor.

489e-2 to 4 Independent Study in Corrections. Supervised readings or independent investigative projects in the various correctional aspects of crime control, institutional management, and specific correctional programs. Prerequisite: consent of instructor.

501-12 (4,4,4) Criminal Behavior: Problems and Characteristics. Must be taken in a,b,c sequence. Communalities in multidisciplinary study and knowledge in criminal behavior presented by teaching teams.

515-4 Crime Prevention and Control. Development factors and active intervention techniques in preventing crime and delinquency. The roles of agencies such as police, schools, churches, mental health clinics, and other service organizations.

561-4 World Criminal Justice Systems. Comparative criminal justice systems in world regions and nations including the United Nations. Prerequisite: consent of instructor.

572-4 Seminar in Criminology.

578-1 to 6 Seminar in Correctional Rehabilitation Counseling. (See Rehabilitation 578.)

580-4 Design, Planning, and Management in the Administration of Justice. Simulated planning and design experience with real justice system problems. Each student is required to investigate a criminal justice sub-system, study the literature and theoretical foundations on modifying such systems, and develop a plan to deal with the system.

582-4 Criminal Law and the Correctional Process. (See Government 582.)

583-4 to 12 Supervised Field Work (Internship.) Experience in state and federal institutions, probation and parole departments, juvenile courts, delinquency control programs, and public or voluntary agencies. Orientation sessions precedes placement. Prerequisite: consent of instructor. Graded on S/U grade system.

584-4 Seminar in Correctional Program Management. (See Government 584.)

599-1 to 9 Thesis. Prerequisite: written permission of academic coordinator.

Agricultural Industries

410-2 to 4 Problems in Agricultural Services. Discussion, assignments, and special workshops on problems related to inservice training programs in the agriculturally related fields. Development of more effective programs in working with farm people. Prerequisite: graduate student in agricultural services or consent of instructor.

411-3 Agricultural Extension. A study of the history, organization, objectives, programs, and methods of agricultural extension work. Prerequisite: junior standing.

412-4 Principles of Agricultural Mechanization. Theory and use of remote controls, electric motors, survey kits, and other devices adaptable to the needs and interests of educators involved in agricultural mechanization laboratories. Prerequisite: Secondary Education 310.

417-4 Agricultural Development in Emerging Countries. Principles and practices in improving agriculture in areas with limited capital and low levels of technology. Special emphasis on developments in Asia, Africa, and South America. Prerequisites: 204 or GSB 211a.

418-3 Marketing Practices and Problems in Developing Countries. Types of markets, assembly of products, storage, transportation, quality determination, and pricing practices which are peculiar to the developing countries. Market organization and practices for the major export products and the principal domestic foods and fibers in such countries. Methods of progressively improving such markets. Prerequisite: 354 or Economics 215.

450-4 Advanced Farm Management. Methods of analyzing farm enterprises, comparing farm enterprises, comparing farm businesses, allocating farm re-

sources, combinations of enterprises, and production factors. Field trip estimated cost \$5.00.

451-4 AgriBusiness Management. Functions of top management, such as: determining objectives; developing sound and consistent policies for achieving objectives; organizing the administrative personnel to carry out the plans; guiding and maintaining the organization. Prerequisite: senior standing.

456-11 (3,2,2,2,2) Agricultural Marketing Problems and Practices. (a) Cooperatives. Development of the agricultural cooperative movement, agricultural cooperative organization, legal requirements, principles and practices of agricultural cooperative associations. (b) Livestock. Problems and their solutions in marketing livestock. (c) Field Crops. Problems and their solutions in marketing field crops. (d) Dairy and Poultry. Problems and their solutions in marketing dairy and poultry products. (e) Horticultural Crops. Problems and their solutions in marketing horticultural crops. Field trip cost \$5. Prerequisite: 354.

460-4 Agricultural Law. Relations of common-law principles and statutory law to land tenure, farm tenancy, farm labor, farm management, taxation, and other problems involving agriculture. Prerequisite: senior standing or consent of instructor.

471-4 Land Resource Economics. (Same as Forestry 471 and Economics 471.) The use of land as an economic variable in production of goods and services; land markets; group versus individual conflicts; elementary land resources planning techniques. Field trips cost about \$5. Prerequisite: GSB 211, Economic 215, or Forestry 215, or Forestry 470.

473-4 Advanced Agricultural Power Systems. Advanced treatment of engine mechanical and electrical analysis, and hydraulics and engine testing. Prerequisite: 373 or equivalent.

478-4 Agricultural Materials Handling Systems. Arrangement of feed handling, storage, and processing systems for agricultural products. Includes cleaning, sorting, and drying. Prerequisite: 215, 350, or equivalent.

479-4 Animal Behavior. (See Zoology 479.)

482-3 Seminar-Research-Work Experience on International Agricultural Problems. Weekly two-hour discussion period on methods by which foreign students can adapt information and training obtained in U.S. oriented courses to the solution of important agricultural problems in their home countries. Supplemented by work experience and research on the University farms, in laboratories, and in the library.

483-3 Introduction to Communicating Technology in Rural Areas. For field and administrative personnel preparing for or working in regions of rural economic development. Examines ecology and cultural elements of rural populations affecting the communication/adoption of technology. Basic forms common to the flow/communications of new technology. Develops alternative communication strategies for specific programs. Prerequisite: junior standing.

485-3 Principles and Philosophies of Vocational and Technical Education. (See Occupational 485.)

505-3 Agricultural Industries Research Methods. Agricultural economics research methods with particular reference to types of research problems encountered, sources of data, problems in developing new data and methods of analysis. Prerequisite: consent of chairman.

512-3 to 6 Agricultural Occupation Internship. Prepares coordinators to fulfill their responsibilities in selected areas of agricultural related occupations through an internship in the area of specialization and through orientation to related technical information. Prerequisite: 312b or consent of chairman.

520-1 to 6 Readings. Contemporary books and periodicals on selected areas of the field.

525-4 Cooperative Vocational-Technical Education. (See Technical and Industrial Education 525.)

530-4 Dairy Science. Discussion and critical evaluation of research and research techniques used in dairy production research. Prerequisite: 430.

550-4 Production Management. A study of the principles of production economics upon which problems in agricultural production and resource use can be analyzed. Emphasis on principles applicable to the farm business and to farm policy, including concepts relating to the decision-making process and farm planning under perfect and imperfect knowledge and with limited resources. Prerequisites: 12 hours equivalent in economics, agricultural economics, and consent of instructor.

552-2 Advanced Agricultural Prices. Continuation of analysis of factors affecting agricultural prices; the application of these factors in price prediction. Prerequisite: 352.

554-4 Advanced Agricultural Marketing. Current complex problems in agricultural marketing and methods of developing solutions; cooperative activities. Prerequisite: 12 hours or equivalent in economics and agricultural economics.

575-1 to 6 Research. Directed research in selected areas of agricultural industries.

581-1 to 6 Seminar. Problems relating to various phases of the field of agricultural industries, such as farm management, marketing, prices, farm policy, land economics.

588-1 to 12 International Graduate Studies. University residential graduate study program abroad. Prior approval by the department is required both for the nature of program and the number of quarter hours of credit.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Animal Industries

415-9 (5,4) Animal Nutrition. (a) Physical and chemical properties of nutrients and their uses and principles involved in determination of nutrient requirements. (b) An integration of the basic facts concerning the nature of nutrients and their metabolism. Must be taken in a,b sequence. Prerequisites: 315 and organic chemistry or equivalent.

419-4 Stable Management and Horsemanship. Lectures and laboratory experience. Routines of stable operation, horse care, training, and management. Field trips. Prerequisite: 319.

420-4 Commercial Poultry Production. Broilers, layers, and turkeys as adapted to poultry speciality farms. Field trips. Prerequisite: 121.

421-3 Animal Production in Developing Countries. World animal production, practices, and institutions which affect productivity. The adaptability of animals to serve mankind. Prerequisite: one year biological science.

430-4 Dairy Cattle Breeding and Management. Application of principles of breeding, nutrition, physiology to the management of the dairy herd. Field trip required. Prerequisite: 332.

431-4 Reproductive Physiology of Domestic Animals. Comparative physiology of reproduction in farm animals and the principles of artificial insemination. Prerequisite: 121 or one course in physiology.

432-3 Quantitative Inheritance of Farm Animals. A review of the principles underlying the influence of mutation, selection, migration, and random drift in animal breeding population; estimation and interpretations of heritabilities and genetic correlations; effects of variances of quantitative traits of farm animals. Prerequisite: 332.

433-3 Dairy Cattle Nutrition. Application of the latest knowledge of digestion and metabolism in ruminants, and their nutritional requirements to dairy herd feeding. Prerequisite: 315.

434-3 Physiology of Lactation. Anatomy of the mammary gland, hormonal control of development and secretion, milk synthesis, physiology and mechanics of milking. Prerequisite: organic chemistry and physiology.

456b-2, 456d-2 Agricultural Marketing Problems and Practices. (See Agricultural Industries 456.)

465-4 to 5 Swine Production. Breed selection, breeding, feeding, management, and marketing of swine. Field trip. Prerequisites: 315, 322.

479-4 Animal Behavior. (See Zoology 479.)

480-4 Sheep Production. Breeding, feeding, and management of sheep. Field trip. Prerequisites: 315, 332, 431.

485-4 Beef Production. Breeding, feeding, and management of beef and dual-purpose cattle. Field trip costs about \$3. Prerequisites: 315, 332, 341.

487-4 Commercial Livestock Feeding. Principles and problems in fattening beef cattle and sheep for market. Prerequisites: 315, organic chemistry.

502-3 Surgical Research Techniques in Farm Animals. Basic methods of experimental surgery and sampling of biological materials in research on farm animals. Practice of techniques discussed in the lectures. Prerequisite: consent of instructor.

505-8 (4,4) Research Methods in Agricultural Science. (a) Experimental design and biometry as applied to agricultural research. (b) Instrumentation

and analytical procedures as applied to agricultural research. Prerequisite: consent of instructor.

515-4 Nutrient Utilization in Domestic Animals. Nutrient utilization, including digestion, absorption and metabolism, and relationship of energy metabolism to energy source and body function. Prerequisite: 415a, 505b.

516-4 Minerals and Vitamins in Animal Nutrition. Basic and applied principles of mineral and vitamin metabolism. Emphasis on metabolic functions, reaction mechanisms, and interrelationships. Prerequisite: 515 or Chemistry 350.

520-1 to 6 Readings in Animal Industries. Readings in specialized fields under direction of approved graduate specialists.

575-1 to 6 Individual Research. Investigation of a problem in animal science under the supervision of an approved graduate specialist.

581-1 to 6 Seminar. Problems relating to various phases of animal industries.

588-1 to 12 International Graduate Studies. University residential graduate study program abroad. Prior approval by the department is required both for the nature of program and the number of quarter hours of credit.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Anthropology

400-4 Man and Culture. The nature of culture and cultural process. Relationships of culture and man as an individual and as a group. Emphasis on "the anthropological point of view." Prerequisite: 250 or equivalent.

401-4 Language in Culture. Language as a part of culture. Linguistics and the study of culture. Prerequisite for undergraduates: 250, or equivalent, or consent of department.

403-3 or 4 General Archaeology. Theory and methodology. The basic concepts underlying anthropological interpretations of man's past. Prerequisite for undergraduates: 302 or consent of instructor.

404-6 (3,3) Technology, Art, and Anthropology. Development of man as an art-loving and tool-using being. Technological and artistic traditions of non-western peoples, past and present. (a) Technology and anthropology. (b) Art and anthropology. Sequence a,b recommended. May be taken b,a or a or b only. Prerequisite: for undergraduates, 250 or equivalent.

407-3 General Ethnology. Ethnology as a major sub-field of anthropology, including interest in ethnohistorical studies as well as the more traditional aspects of the field. Prerequisite for undergraduates: 250 or equivalent.

408-3 History of Anthropological Thought. The growth of anthropology as an academic discipline to about 1940, with emphasis upon the concepts and ideas since 1860. Prerequisite for undergraduates: 250 or equivalent.

409-3 Applied Anthropology. The application of anthropological principles to the solution of problems of the modern world. Contributions of anthropology to the work of the educator, social worker, administrator, business man, government official, and other specialists dealing with man in Western and non-Western cultures. Prerequisite for undergraduates: 250 or equivalent.

410-3 Current Problems in Social Anthropology. Current problems in the description and analysis of non-Western social systems. Emphasis on kinship and social structure. Prerequisite: for undergraduates, 310 or consent of instructor.

413-3 Introduction to General Linguistics. General, philosophical. Emphasis on linguistic theory, origin of language, acquisition of language, language change, dialectology. Prerequisite: for undergraduates, 250 or equivalent, or consent of department.

415-3 Logic of the Social Sciences. (Same as Philosophy 415). Logical and epistemological examination of the social studies as types of knowledge. Basic problems in philosophy of science with major emphasis upon social science: relationship of theory to fact, nature of induction, nature of causal law, testability, influence of value judgments, etc. Intended for students with considerable maturity in a social science or in philosophy.

418-4 Languages of the World. Emphasis on language families, linguistic history and genetic relationships, and typological classification. Of special interest to specialists in fields other than linguistics. Prerequisite: consent of department.

430-3 Archaeology of North America. An introduction to the methods of archaeology and a survey of prehistoric Indian cultures north of Mexico, with

particular emphasis upon the cultures of the Mississippi Valley. Prerequisite for undergraduates: 250 or equivalent.

441-3 Comparative Economics. A comparative study of economic systems, with emphasis upon those found in primitive societies. Studies of systems which fall outside the conventional systems such as capitalism, socialism, and fascism. Prerequisite for undergraduates: 250 or equivalent.

442-3 Comparative Folklore. A comparative study of the role of folklore in various cultures of the world, with emphasis upon non-literate societies. Analysis of motifs, themes, and other elements; comparisons between non-literate and literate groups. Prerequisite for undergraduates: 250 or equivalent.

443-3 Comparative Law. Legal premises upon which societies are based; systems of the non-literate world; case studies of instances where these systems come into contact with those of literate, technologically advanced cultures. Prerequisite for undergraduates: 250 or equivalent.

444-3 Comparative Religion. Comparative study of religious systems, with emphasis upon those of non-literate societies. Examination of basic premises and elements of those belief systems normally excluded from discussions of the "Great Religions." Prerequisite for undergraduates: 250 or equivalent.

445-3 Cross-Cultural Studies of Personality. Similarities and differences in personality structures including the historical development of this as an anthropological subdiscipline. Basic and modal personality, national character, culture change and personality, culture-bound reactive syndromes, and cognitive anthropology discussed. Prerequisite: 250 or equivalent.

465-6 (2,2,2) Museum Methods. Practical experience and associated philosophical-educational context of museum methods in exhibition/display, processing, cataloging, preservation, etc. Prerequisite: junior standing.

466-2 Museum Administration. Problems and policies associated with museum administration, either as a specialist in large organizations or as general museologist when the director serves as a multi-purpose staff member. Prerequisite: junior standing.

470-9 (3,3,3) Special Studies of World Languages. Languages or language families with focus on history and structure. Any one quarter concentrates on language of a major geographical area. Prerequisite: 413, or Linguistics 401 a or b, or consent of instructor.

471-6 (3,3) Ethnomusicology. (Same as Music 471 except no prerequisite.)

483-1 to 18 Individual Study in Anthropology. Guided research on anthropological problems. Consent of department required to enroll, unless required and scheduled with another anthropology course.

497-1 to 18 Honors Individual Research. Honors students participate in graduate seminar work with the consent of the instructor. Prerequisite: for undergraduates, 250 or equivalent, or consent of instructor.

499-3 to 12 Honors Thesis. Directed work on research problems. The topic of the thesis may be simple or complex, depending on the time expended on it. Paper to be of publishable quality. Prerequisite: 399 and consent of department.

From year to year, the areal and topical coverage of the following 17 courses will vary, as will the instructors. Students should consult the department about subjects to be covered.

510-3 to 9 Seminar in New World Archaeology.

511-3 to 9 Seminar in Mesoamerican Archaeology.

512-3 to 9 Seminar in Old World Archaeology.

520-3 to 9 Seminar in the Ethnology of the New World.

521-3 to 9 Seminar in the Ethnology of Mesoamerica.

522-3 to 9 Seminar in the Anthropology of Oceania.

523-3 to 9 Seminar in the Anthropology of Africa.

545-3 to 9 Seminar in Linguistics.

550-3 to 9 Seminar in the Cultures of Latin America.

560-3 to 9 Seminar in Comparative Social Organization.

562-3 to 9 Seminar in the Anthropology of Contemporary Peoples.

565-3 to 9 Seminar in Cultural Change and Development.

567-3 to 9 Seminar in Anthropological Theory and Method.

570-3 to 9 Seminar in Art and Technology.

575-3 to 9 Seminar in the Individual and Culture.

581-3 to 9 Seminar in Anthropology.

582-1 to 27 Problems in Archaeology. Guided research upon archaeological

problems. Graded on a Satisfactory/Unsatisfactory basis only. Prerequisite: consent of department.

584-1 to 27 Problems in Cultural Anthropology. Guided research upon problems of ethnology, social anthropology, and linguistics. Graded on a Satisfactory/Unsatisfactory basis only. Prerequisite: consent of department.

585-1 to 27 Readings in Anthropology. Guided readings designed to cover special topics and to fill gaps in the student's specialized anthropological background. Prerequisite: consent of department.

595-6 (3,3) Field Methods in Ethnology. Includes anthropological methods of enquiry and documentation of culture and habitat together with appropriate instruction in the techniques of field work, such as photography and sound recording. Stress will be laid in the second part of the course (595b) on the linguistic context of culture; its appropriate recording and structural body.

596-6 (3,3) Field Methods in Archaeology. Includes anthropological methods of enquiry and documentation of culture and habitat, together with appropriate instruction in the techniques of field work. Stress will be laid in the second part of the course (596b) on the practical application of archaeological methods and techniques to field work.

597-1 to 27 Fieldwork in Anthropology. To be arranged with department. Graded on Satisfactory/Unsatisfactory basis only.

599-1 to 9 Thesis.

600-1 to 36 Dissertation. No more than 18 hours in any quarter.

Applied Science

401-12 (4,4,4) X-Ray Crystallography. (a) Introductory Crystallography. Lattice theory of the crystal. Miller indices. Crystal zones. The Bravais lattices. Symmetry elements. Proper and improper rotations. Point groups: crystal classes. Operators involving translation. Space groups. Elements of crystal structure. Coordination. Structure types. (b) X-Ray Diffraction Techniques. X-ray diffraction by single crystals: fundamental equations. Reciprocal lattice and Ewald sphere. Optical analog: The optical diffractometer. Single crystal photographic methods: the Laue method: rotating and oscillation, Weissenberg, Buerger-precession and Jong-Bourman. Divergent and convergent-beam techniques. Interpretation of the x-ray diagrams. Diffractometric methods; fundamentals. Identification of polycrystalline materials with x-ray diffractometer (power method). Single crystal diffractometry. Absolute intensity measurements. (c) Crystal Structure Analysis. Fundamental diffraction relations. Determination of the cell size, chemical formula, symmetry and space group. Measurement of intensities: geometrical and physical factors affecting intensities. The structure factor; phase of the structure factor. The anisotropic temperature factor. Fourier synthesis. Electron-density projections. The phase problem. Utilization of anomalous dispersion. Direct determination. The Patterson method. Refinement of the structure with high speed computers.

410-8 (4,4) Electronics and Instrumentation for the Life Sciences. (a) Review of electrical theory and electrical aspects of biological systems; introduction to circuit analysis; fundamentals of instrumentation, primarily electronic; laboratory. (b) Transducers and characteristics of instruments used in biological research; basic computer and data-system theory and applications; analysis of biological waveforms; simulation of biological systems; laboratory.

418-3 Digital Computers in Research. Computational techniques for matrix inversion, solution of linear equations, and characteristic roots and vectors; least square analysis, curve-fitting, and regression; design of experiment; solution of nonlinear equations; finding zeros of a function, min-max functional approximation techniques; generation of approximate solutions. Prerequisite: Engineering 222 and Mathematics 150a.

421-3 Programming Languages. A study of the development and use of programming languages for high speed stored program digital computers. Included are problem-, procedure-, and machine-oriented languages, symbolic languages, interpretive systems, macro assemblers, and list processors. A comparison of the languages will be made and each student will prepare programs using the languages studied. Prerequisite: Engineering 222 or consent of instructor.

422-3 Programming Systems. The use and methods of electronic data processing systems. Topics are searching, ordering, codifying, information retrieval, process control, executive routines, and heuristic programming. The

student will apply system techniques for solution of problems using one or more of the available high speed digital computers. Prerequisite: Engineering 222 or Mathematics 225 or consent of instructor.

430-1 to 8 Special Problems. Special opportunity for students to obtain assistance and guidance in the investigation and solution of selected technical problems. Prerequisite: consent of coordinator.

431-9 (3,3) Nuclear Science. An introductory course to provide a background for further work in nuclear science. Lectures and problems in radioactivity and the uses of radio isotopes, nuclear engineering, introductory reactor theory, and use of an analog computer in solving problems of neutron transport and reactor kinetics. Prerequisites: Mathematics 252b and Applied Science 300.

432-3 Nuclear Laboratory. Health physics instruments; characteristics of alpha, beta, and gamma rays; radioactive decay; counting statistics; fundamental neutral experiments. Prerequisite: 300 or Physics 300.

444-16 (4,4,4,4) Materials Science. (a) Crystal structure of materials. Concepts of ionic, metallic, van der Waals, and covalent bond; hydrogen bond; solid solutions; interstitial phases. Coordination structures. Radicals in crystal structures. Long chain molecular crystals. Clathrate and molecular complexes. The structure of polymers, glass, and liquids. (b) Crystalline materials preparation. Phase rule. Crystal growth. Homogeneous and heterogeneous nucleation. Absorption. Impurities. Rate of crystallization. Preparative crystallization. Twinning. Spiral growth theory. Recrystallization. (c) Perfection of crystalline materials. The solid as an imperfect body. Isomorphic substitution. Composition disorder. Electron holes and traps. Diffusion. The role of dislocations in growth and phase transition. Crystal surface. The role of imperfections. (d) Thermodynamics of solids. Potential energy of ionic and molecular crystals. Band theory. Stability of solid phases. Equilibrium diagrams. Influence of temperature, pressure, and composition. Polymorphism: role of crystal structure. The thermodynamics of the imperfect crystal.

470-6 (3,3) Engineering Analysis. (a) Basic vector field theory; transformation theorems. Methods of solution for basic ordinary differential equations with applications to engineering systems. Prerequisite: Mathematics 252. (b) Basic methods of solution for partial differential equations with emphasis on applications of the Laplace, Poisson and heat equations to engineering problems. Basic complex variables, matrix theory, numerical analysis and simulation techniques applied to engineering systems. Prerequisite: 470a or Mathematics 305a.

503-12 (4,4,4) Physical Properties of Crystalline Materials. (a) In Relation to Its Symmetry. General principles: The groundwork of crystal physics. Transformations and second-rank tensors. Equilibrium properties: The stress tensor. The strain tensor and thermal expansion. Piezoelectricity: Third rank tensors. Elasticity: Fourth-rank tensors. The matrix method. Thermodynamics of equilibrium properties of crystals. Transport properties: Thermal and electrical conductivity. Thermoelectricity. Crystal Optics: Natural and artificial double refraction: second order effects. Optical activity. (b) In Relation to Its Structure I. Thermal expansion in relation to crystal structure. Compressibility in relation to crystal structure. Influence of temperature. Magnetic and electrical properties in relation to crystal structure. Piroelectricity and piromagnetism. Ferroelectricity and ferroelectrics. Antiferroelectrics. Ferrielectrics. Ferromagnetic crystals. Antiferromagnetics. Domain structures. Phase transitions. (c) In Relation to Its Structure II. Ionic polarizabilities. Influence of temperature. Influence of structure in crystal optics. Molecular refractivity. Structural theory of optical activity. Elasticity and crystal structure. Piezoelectricity. Plastic deformation. Slip. Creep. Cleavage.

504-12 (4,4,4) X-Ray Diffraction and the Solid State. (Same as Physics 504.)

(a) Diffraction by an arbitrary object in Fourier transform formulation, symmetry properties of scattering functions, the convolution theorem, the Q function or autoconvolution, the two repeated Fourier transformations, X-ray diffraction by an atom, by a molecule, by an ideal crystal and by a finite crystal. Optical transforms: Fraunhofer diffraction of a circular aperture, of a molecule and of a crystal of disc like atoms. The Fourier synthesis and the Patterson synthesis. The inverse Fourier syntheses. High speed computations of Fourier transforms and of Fourier series. (b) The Born-Laval theory of temperature diffuse scattering of x-rays: Determination of elastic constants, dispersion relations of frequencies and velocities, interatomic force constants

and elastic vibrational spectrum. Determination of Debye characteristic temperatures from the inversion phenomenon of one-phonon scattering. The Difference Fourier Transform approach. The use of optical diffractometry and optical convolution in the interpretation of imperfect crystals.

521-6 (3,3) Design of Automatic Programming Language Processors. Analysis of design and construction of automatic programming language processors. An investigation of the structure of scientific and business oriented compilers, list processors, and information processing languages. The student will be expected to review recent papers on these topics, to prepare an aspect of the theory, prepare flow charts and program segments of the processors for the languages studied. Prerequisite: 421.

522-6 (3,3) Programming Systems Design. Design of monitor systems, executive routines, simulators and other systems. An analysis of problems encountered in designing a programming system. The student will be expected to review recent papers on these topics, prepare flow charts, to complete an aspect of the theory, and to write programs for segments of the systems studied. Prerequisite: 442.

570-2 to 6 Special Investigations. For students who wish to make a thorough study or investigation of a specific problem in applied science.

580-1 to 9 Seminar. Collective and individual study of selected issues and problems relating to various technological areas.

599-1 to 9 Thesis.

Art

Art Education: 408, 460, 466, 560, 566, 599.

Art History: 445, 482, 483, 571, 573, 599.

Studio: 401, 405, 406, 410, 416, 420, 430, 436, 440, 441, 446, 493, 501, 502, 504, 506, 511, 516, 520, 526, 530, 540, 546, 599.

401-2 to 12 Research in Painting.

405-2 to 12 Studio in Sculpture.

406-2 to 12 Studio in Painting.

408-4 Art Education for Elementary Teachers II.

410-2 to 12 Research in Prints.

416-2 to 12 Studio in Prints.

420-2 to 12 Research in Pottery.

426-2 to 12 Studio in Pottery.

430-2 to 12 Research in Metal Construction.

436-2 to 12 Studio in Metal Construction.

440-2 to 12 Research in Weaving.

441-2 to 12 Studio in Drawing.

442-2 to 12 Studio in Drawing. Prerequisite: 341-12.

445-9 (3,3,3) Modern Art. (a) 19th century. (b) Early 20th century, (c) Mid 20th century.

446-2 to 12 Studio in Weaving.

447a-3 The Art of Ancient Egypt and the Near East. A survey of principal monuments and archeological evidence relevant to an appraisal of the origins and development of art in the early civilizations of Africa, Western Asia, Europe and the Aegean from prehistoric times to the rise of the Persian Empire.

447b-3 The Art of Ancient Greece. A study of the origins, development and influence of art produced in Greece and its colonies from the Bronze age to the Roman Empire.

447c-3 The Art of The Ancient Romans. An appraisal of the material culture of art of the Roman civilization, its debt to other ancient civilizations and achievements in architecture, sculpture and painting from its foundation until the reign of Constantine.

448a-3 Early Christian and Byzantine Art. A survey of problems related to art and architecture produced in Christian communities and under the aegis of the Byzantine Empire until the Fall of Constantinople.

448b-3 Early Medieval and Romanesque Art. A study of the development of architecture and Art in Europe from the fall of the Roman Empire to the formulation of the Gothic style.

448c-3 Gothic Art. A survey of major developments in Architecture, Sculp-

ture, and painting in Europe from the earliest formulation of Gothic Style to its decline in the Renaissance period.

449a-3 Art of the Renaissance in Europe. A study of developments in art during the 15th Century in Italy and the Lowlands leading to the High Renaissance and its impact in European painting, sculpture, and architecture of the 16th Century. Prerequisite: 225a,b,c.

449b-3 Baroque Art in Europe. A study of the formation of national style in the arts of Italy, Spain, Austria, Germany, France, Flanders and Holland from the 16th Century to the 17th Centuries with particular attention to major masters.

449c-3 The Art of 18th Century Europe. A study of architecture, sculpture and painting in European countries and colonies from the end of the 17th Century to the French Revolution with particular emphasis on the Rococo Art of Italy, England, Spain and France.

450-1 The Visual Arts in Higher Education.

451a-3 Art of Ancient Asia and America. A survey of early developments in architecture and the plastic arts of related civilization in India, China, Japan and Ancient America, from prehistoric evidence to major monuments of the First Millennium, A.D.

451b-3 Painting In the Far East. General survey of the major pictorial arts of China from six dynasties to Ch'ing dynasty, or Korea from Silla period to Ti dynasty, and of Japan from Asuka to Edo periods. An attempt will be made to trace influences central to the development and spread of important styles and to relate art to the classics of Oriental aesthetics.

451c-3 Islamic Art. A survey of important monuments and art works produced in the context of Islamic culture in the Near East, Africa, Spain, Persia, Turkey and India from the 17th Century to the present.

460-2 to 12 Research in Art Education.

466-2 to 12 Studio in Art Education.

471-3 Baroque Painting in Italy. Major developments in style and expression in Italian painting from the late Mannerist period until the early 18th Century.

482-3 Art History Seminar. Lectures, readings, and reports on artists, styles, subjects of special interest which will be announced periodically.

483-3 Research in Art History. Individual research in the painting, sculpture, architecture, and related arts of the various periods.

493-2 to 12 Advanced Sculpture.

501-2 to 12 Seminar in Painting.

502-2 to 12 Seminar in Sculpture.

504-2 to 12 Research in Sculpture.

506-2 to 12 Research in Painting.

511-2 to 12 Seminar in Prints.

516-2 to 12 Research in Prints.

520-2 to 12 Seminar in Pottery.

526-2 to 12 Research in Pottery.

530-2 to 12 Seminar in Metal Construction.

536-2 to 12 Research in Metal Construction.

540-2 to 12 Seminar in Weaving.

541-2 to 12 Research in Drawing. Prerequisite: 12 hours 300-level courses.

546-2 to 12 Research in Weaving.

560-2 to 12 Seminar in Art Education.

566-2 to 12 Research in Art Education.

571-2 to 5 Readings in Art History.

573-3 to 12 Problems of Art History. A detailed study of single works of stylistic problems in selected areas of world art.

599-2 to 9 Thesis.

Black American Studies

409-8 (4,4) Black American Social Problems. Comparative study of the social problems which afflict black Americans and their consequences including crime and delinquency, mental and emotional disorders, drug addiction, housing condition, poverty and unemployment, and labor conditions. Must be taken in a,b sequence. Prerequisite: consent of instructor.

Botany

400-5 Plant Anatomy. An introduction to cell division, development, and maturation of the structures of the vascular plants. Laboratory fee \$5. Prerequisites: 301 or consent of instructor.

404-5 The Algae. Structure, development, and relationships of the algae. Laboratory and some field work. Laboratory fee. Prerequisite: 300.

405-5 Mycology. Structure, development, and relationships of the fungi. Problems of economic and scientific interest stressed. Laboratory. Prerequisite: 300.

406-5 Industrial Mycology. A consideration of the myriad ways in which fungi impinge on man's affairs, with special emphasis upon their various industrial application—real and potential. 3 lectures and 4 laboratory hours per week. Prerequisite: 405 or consent of instructor.

410-3 The Taxonomy and Ecology of Bryophytes and Lichens. Floristic studies of the moss, liverwort, and lichen communities of southern Illinois. One lecture and 4 laboratory hours per week. Prerequisite: consent of instructor.

411-4 The Bryophytes and Pteridophytes. Structure, development, and relationships of the liverworts and mosses, and the ferns and fern allies. Laboratory. Prerequisite: 301.

412-4 The Spermatophytes. Structure, development, and relationships of the gymnosperms and angiosperms. Laboratory fee. Prerequisites: 301, GSA 303.

414-5 Paleobotany. (Same as Geology 414.) An introduction to the study of fossil plants emphasizing the major features of plant evolution and the applications of paleobotany to problems in the botanical and geological sciences. Lecture, laboratory, and field trips. Student cost about \$5. Prerequisite: 303 or Geology 221.

420-4 Physiology of Fungi. A treatment of the physiological activities of fungi with particular stress upon (1) those aspects peculiar to the group by virtue of their being nonchlorophyllous plants, and (2) an exploration of the possible explanations of the parasitic vs. the saprophytic habit. Prerequisite: consent of instructor.

425-15 (5,5,5) Advanced Plant Physiology. (a) Physics of the plant, water relations, membrane phenomena, photobiology. (b) Chemistry of the plant, anabolic and catabolic processes, photosynthesis, respiration, chemosynthesis. (c) Covers the absorption, translocation, function and interaction of inorganic nutrient elements in green plants with application to forest, agronomic, and horticultural species. Prerequisites: 320, Chemistry 350, or a chemistry minor.

428-3 Plant Nutrition. The physiological importance of carbon-, nitrogen-, and phosphorus-containing compounds is stressed. Prerequisites: organic chemistry, minor in botany or agriculture.

440-14 (4,5,5) Advanced Ecology. (a) management and ecology of grasses and grasslands, (b) physiology and autecology of forest species, (c) sampling methods and community analysis. Prerequisite: Biology 307 or consent of department.

446-12 Tropical Ecology. Three weeks of marine ecology on the atolls and extensive barrier reef near Belize, British Honduras, and three weeks of terrestrial ecology at several locations inland. Prerequisite: advanced undergraduate or graduate standing in one of the biological sciences.

447a-4 to 12 Botanical Field Studies in Latin America. Four to eight weeks long. Acquaints students with plants in various environments of Latin America and with methods of field study, collection, and preservation. Cost per individual will be determined by type of study and location. Prerequisite: advanced standing in one of the biological sciences and consent of instructor.

449-3 Elements of Taxonomy. Principles of taxonomic research including classical and experimental methods. 1 lecture and 4 laboratory hours per week. Field and laboratory expenses \$5. Prerequisite: 303 or equivalent, or consent of instructor.

450-3 Plant Geography. World distribution of plants and plant communities related to historical, environmental, and floristic factors. Prerequisite: consent of instructor.

456-5 Plant Pathology. (Same as Plant Industries 355.) A study of plant diseases caused by fungi, bacteria, and viruses. Special attention given diseases of southern Illinois plants. Laboratory and field trips. Laboratory fee. Prerequisite: consent of instructor.

457-4 Forest Pathology. Nature and control of forest and shade tree diseases. A study of tree diseases in forests, parks, streets, and nurseries. Fungi important in decay and stain of timber and its products are included. Laboratory fee. Prerequisite: 456 or consent of instructor.

470-4 Methods of Teaching High School Biology. Methods, objectives, types of courses taught in secondary school biology. Laboratory and field trips. Prerequisite: major in botany or zoology.

484-4 Palynology. (See Geology 484).

490-6 (4,2) Photographic Methods in Scientific and Biological Photography. (a) Black and White. (b) Color. Specimen photography, photomicrography, macrophotography, infrared and ultraviolet photography. Slides for presentation, materials and methods used in scientific publications. Prerequisite: consent of instructor.

500-5 Biosystematic Plant Anatomy. Study of the taxonomic implications of developmental and positional variation of tissues and cell types within plants. Two lecture and six laboratory hours per week. Prerequisite: 400. Recommended: 412, 449.

503-20 (5,5,5,5) Advanced Angiosperm Taxonomy. Systematic treatment of all families of (a,b,c) dicotyledoneae and (d) monocotyledoneae. Prerequisite: consent of instructor.

522-5 Advanced Microtechnique. Preparation and presentation of research materials. Laboratory work only. Prerequisite: consent of department. Credit on work completed.

524-3 Advanced Plant Genetics. A consideration of incompatibility systems, paramutation, cytoplasmic inheritance, developmental genetics, and other genetic topics as they occur in higher plants. Prerequisite: Biology 305 or equivalent.

525-5 Cytology. (Same as Zoology 525.) Physiochemical, chemical, and morphological organization of the cell. Ultrastructure of the cellular organelles. Cytochemical and submicroscopical organization of the hereditary material. Morphology and function of the spindle of the nucleus and chromosomes during the mitotic cycle. Synthesis and replication of nucleic acids. RNA and protein synthesis. The genetic code. Enzymes and cell metabolism. Prerequisite: 305.

526-5 Cytogenetics. Correlation of cytology with genetics. Cell mechanics and nuclear division. Mitosis, meiosis, crossing over and mapping of chromosomes. Mutation, mitotic agents, effect of irradiation, polyploidy, structural aberrations, polytene chromosomes. Synthesis of new species, comparative karyomorphology. Evolution and cytogenetics. Prerequisite: 525 or consent of instructor.

533-3 to 4 Growth and Development in Plants. External and internal factors as they effect development and growth of plants, photoperiodism, and the role of growth-promoting substances. 1 hour to be arranged. Prerequisite: 320.

535-3 Energetics of Aquatic Ecosystems. Energy flows in aquatic habitats; photosynthesis and respiration rate determinations under natural and laboratory conditions; determination of dominant genera in the communities; daily and annual energy budgets; factors influencing utilization of light by biotic systems; influence of daily and annual energy budgets on stratification on current systems, and on seasonal succession in the community. Prerequisite: consent of instructor.

542-3 Biosystematics. An examination of species concepts and factors effecting the formation of species. Evidence from the fields of genecology, cytotaxonomy, genetics, numerical taxonomy, and chromotography are discussed as well as the phenomena of hybridization, polyploidy, and apomixis. Prerequisite: 305.

543-5 Experimental Ecology. Experiments on plant response to environmental factors. Design of experiments, statistical methods, presentation of individual research findings. Laboratory. Prerequisites: 320, GSA 340, or consent of instructor.

551-4 The Natural Vegetation of the Mississippi Basin, Upland. Floristic studies of the upland vegetation which occurs in the central basin of the Mississippi River. Student cost \$10. Prerequisite: GSA 303 or consent of instructor.

552-4 Mississippi Flora, Aquatic. An analysis of the aquatic vegetation of the Central Mississippi basin, discussing importance to wildlife. Student cost \$10. Prerequisite: GSA 303 or consent of instructor.

555-12 (4,4,4) Advanced Plant Pathology. (a) A study of facultative fungal parasitism with emphasis on the physiology of host-parasite interactions. (b)

A study of obligate fungal parasitism with emphasis on the physiology of host-parasite interactions. (c) A study of bacterial and viral parasitism with emphasis on the physiology of host-parasite interactions and biochemistry of virus reproduction. Prerequisite: 456 or consent of instructor.

570-2 to 5 Readings.

580-1 to 3 Seminar. To be taken by all graduate students majoring in botany.

584-3 Advanced Palynology. (See Geology 584.) Prerequisite: 484.

590-2 to 4 Introduction to Research. Methods of presentation of research materials, including written reports, graphs, photographs, bibliographies. Taxonomy students learn to write keys and descriptions; Botanical Latin; nomenclature.

591-3 to 9 Research. Assignments involving research and individual problems. Prerequisite: consent of department.

599-3 to 9 Thesis. Work in the research for and presentation of a thesis. Not more than 9 hours nor fewer than 5 hours will be allowed on thesis work. Total hours in 591 and 599 cannot exceed 15 hours to be applied to the master's degree.

600-1 to 36 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Business Administration

500-4 Research Methods and Communications. Analysis and functional applications of the communication process in the planning, design and presentation of business research data. Provision of a rationale for subsequent studies involving investigative methods. Prerequisite: enrollment in MBA program or consent of instructor.

501-4 Quantitative Methods for Decision Making. Study of the means for testing the validity and reliability of managerial conclusions. Selected areas include criteria development, value analysis, and statistical analysis, including both parametric and non-parametric applications of analysis. Prerequisite: enrollment in MBA program or consent of instructor.

502-4 Business and Society. Study of the external environment of business; social, political, legal, and ethical dimensions; conflicts of business-labor-government power groups. Social responsibilities in the formulation of a business management philosophy. Prerequisite: enrollment in MBA program or consent of instructor.

510-4 Managerial Accounting and Control. Relationship of accounting to the functions of production, finance, and distribution; emphasis is given to the usefulness of accounting in administering and controlling an enterprise. Prerequisite: enrollment in MBA program or consent of instructor.

511-4 Accounting Theory. Contemporary advanced accounting theory, including controversial issues with emphasis on net income determination and asset valuation; particular attention given to current publications of the professional and governmental agencies.

512-4 Advanced Auditing. Development of auditing theory and its implications for auditing practice; emphasis on auditing standards and concepts, pronouncements and bulletins of the American Institute of Certified Public Accountants, and current literature.

513-4 CPA and Advanced Accounting Problems. Highly technical problems not covered in undergraduate courses primarily drawn from the American Institute of Certified Public Accountants' examinations.

514-4 Controllorship. Function of controllorship in a business organization; analysis of the duties and responsibilities of a controllor; contribution of a controllor to effective planning, coordination, and control through accounting; case studies.

519-4 Seminar in Accounting. Discussion of current problems and theories in accounting. Prerequisite: enrollment in MBA program or consent of instructor.

521-4 Business Conditions Analysis. Intensive review of national income accounting and macro theory. Source material and analytical techniques. Student required to make detailed forecast of gross national product, industry, and a company projection. Prerequisite: enrollment in MBA program or consent of instructor.

525-4 Cooperative Vocational-Technical Education. (See Technical and Industrial Education 525.)

526-4 Managerial Economics. Develops conceptual framework for business decision making with emphasis on demand, costs, prices, and profits. Credit may not be earned in both Economics 440 and this course. Prerequisite: enrollment in MBA program or consent of instructor.

530-4 Financial Management. A study of financial principles and practices with special emphasis on their relation to managerial planning and control. Prerequisite: enrollment in MBA program or consent of instructor.

531-4 Financial Policies. An evaluation of selected financial policies of corporate enterprise with emphasis on capital budgeting, on the equity and current position.

532-4 Financial Institutions and Markets. The principal financial institutions and markets will be studied in relation to their contribution to the efficient operation of the individual enterprise and the total economy. Prerequisite: enrollment in MBA program or consent of instructor.

533-4 Investment Concepts. Fixed return and variable return securities, investment services, industry and issue analysis, empirical studies of groups and individual stock price movements. Prerequisite: enrollment in MBA program or consent of instructor.

539-4 Seminar in Finance. Current issues and practices in business finance. Each student will select a problem for intensive exploration and report his findings to the class.

540-4 Managerial and Organization Behavior. Case analyses of human problems in the business organization. Application of findings of behavioral science research to organizational problems. Development of direction and leadership skills. Prerequisite: enrollment in MBA program or consent of instructor.

541-4 Operations Analysis and System Controls. Study of production functions of the firm. Analyses of operational inter-relations, design of planning procedures, and the application of control systems. Prerequisite: enrollment in MBA program or consent of instructor.

542-4 History and Theory of Management. An analytical study of the background and growth of management theory from its early beginnings to the present. Emphasis will be largely on the theory and practice of business management.

543-4 Personnel Management. Review of recent developments and current trends in personnel administration based on evaluation of the present state of the literature.

544-4 Production Management. Study of the production function associated with various kinds of businesses. Concern is on the integration of production with other functions of business. Analyses with focus upon managerial problems.

549-4 Seminar in Management. Study of contemporary theory and practice and recent trends in the field of management. Individual and group research reports.

550-4 Marketing Management. A managerial approach in the determination of policies employed in solving problems in marketing.

551-4 Product Strategy and Management. Product management and its relationships with business policies and procedures; the development of multi-product strategies, means of developing such strategies, and the problems and methods of commercialization.

552-4 Advanced Marketing Analysis. The development of advanced procedures, methods and theory of quantitative and qualitative analysis of primary and secondary marketing data. Prerequisite: enrollment in MBA program or consent of instructor.

553-4 Logistics Management. The planning, operation, organization, and management of the logistics system of the firm. Topics: transportation and location as elements of the system, inventories and service as constraints upon the system. Prerequisite: enrollment in MBA programs or consent of instructor.

554-4 Marketing Theory. Emphasis on evaluation of the role of theory in explaining and understanding the marketing function. Theory in related disciplines considered in regard to evolving marketing theory. Prerequisite: enrollment in MBA program or consent of instructor.

555-4 Consumer Behavior. Emphasis on theories and experimental techniques

drawn from the behavioral sciences. Prerequisite: enrollment in MBA program or consent of instructor.

559-4 Seminar in Marketing. Students select and defend, on an individual basis, problems in marketing theory, research, and policy. May be repeated once with consent of department.

580-4 International Business Operations. International dimensions of a firm's operations. Alternative methods for reaching foreign markets, operational adjustments, and specific problems in dealing with foreign environments. Prerequisite: enrollment in MBA program or consent of instructor.

590-4 Independent Study. Directed independent study in selected areas of business administration.

598-4 Business Policies. A decision-making frame of reference for application of functional and tool area courses to business cases. Analysis of external and internal environmental constraints on business policy formulation and administration.

599-4 to 8 Thesis.

Chemistry and Biochemistry

411-4 Intermediate Inorganic Chemistry. Modern inorganic chemistry involving atomic structure, chemical bonds, complexes, and chelate structures; chemistry of familiar and less familiar elements. 3 lecture hours per week. Prerequisite: 461b.

412-3 Inorganic Preparations. A study of several important inorganic syntheses. 1 lecture and 6 laboratory hours per week. Prerequisites: 235; 305b or 341c.

416 X-Ray Crystallography. (See Geology 416.) Prerequisite: Chemistry 121b, 12 hours of physics, one year of calculus.

432-8 (4,4) Instrumental Analytical Measurements. Theory and practice of instrumental analytical measurements, including spectrophotometric, electro-analytical, and chromatographic methods. 2 lecture and 6 laboratory hours per week. May be taken in either sequence. Corequisite: 461b.

433-3 Intermediate Quantitative Analysis. A study of the analysis of complex materials, with emphasis on separations, functional group analysis, and instrumental applications. 2 lecture and 3 laboratory hours per week. Prerequisites: 432a or b and 461c.

438-3 Review of Analytical Chemistry. A review in depth of current analytical practices in research and industry, including fundamental equilibria, separations, and modern instrumental techniques; designed to update graduate students who are deficient in these areas. Prerequisite: Chemistry 433 or equivalent.

446-4 Qualitative Organic Analysis. A systematic study of the separation and identification of organic compounds. 2 lecture and 6 laboratory hours per week. Prerequisite: 235 and 341c or consent of instructor.

450-4 Survey of Biochemistry. Function and metabolism of amino acids, proteins, enzymes, carbohydrates, lipids, and nucleic acids. For preprofessional students, chemistry majors, and others with a one-year course in organic chemistry. Three lecture and three laboratory hours per week. Not offered for graduate credit. Prerequisite: 305c or 341c.

451-9 (3,3,3) Biochemistry. (a) Chemistry and functions of amino acids, proteins, and enzymes. (b) Carbohydrate chemistry, function, and metabolism; biochemical energetics; citric acid cycle; oxydative phosphorylation. (c) Photosynthesis; lipid chemistry, function, and metabolism; nitrogen metabolism; nucleic acid and protein biosynthesis; metabolic regulation. Prerequisite: 235, 305c, or 341c.

455-8 (4,4) Biochemistry Laboratory. Modern biochemical laboratory techniques. (a) Isolation, purification, and characterization of constituents of living cells. (b) Investigations of pathways, kinetics, energetics, and regulatory mechanisms related to metabolism and enzymic activity. One lecture and 8 laboratory hours per week. Prerequisite: 451.

460-5 Principles of Physical Chemistry. A one-term course in physical chemistry designed especially for non-chemistry majors including prospective teachers of high school chemistry. Three hours of lecture and six hours laboratory per week, one hour of which will be used for special instruction. Prerequisite: 235, 305c, or 341c, Mathematics 150b, and one year of physics or consent of instructor.

461-12 (4,4,4) Physical Chemistry. A fundamental course in physical chemistry. 3 lecture and 3 laboratory hours per week. Must be taken in a,b,c sequence. Prerequisite: 235, 12 hours of physics, and Mathematics 252b.

468-4 Elements of Physical Chemistry. Open only to graduate students in chemistry whose diagnostic examinations indicate a need for this course, and to qualified non-chemistry majors. Prerequisites: twelve hours of physics, one year of calculus, and at least one year of chemistry.

471-3 Industrial Chemistry. A survey of modern industrial chemistry and an introduction to chemical research processes. 3 lecture hours per week. Prerequisite: 305b or 341c.

472-12 (4,4,4) X-Ray Crystallography. (See Applied Science 401.)

490-2 Chemical Literature. A description of the various sources of chemical information and the techniques for carrying out literature searches. 2 lecture hours per week. Prerequisites: 235; 305b or 341c, reading knowledge of German or consent of instructor.

496-1 to 12 Chemical Problems. Investigation of individual problems under the direction of a staff member. Prerequisite: consent of instructor and department chairman.

504-3 Mechanisms and Syntheses in Organic Chemistry. Examination of the fundamental mechanisms and syntheses of organic chemistry. Prerequisite: 341c.

511-9 (3,3,3) Advanced Inorganic Chemistry. Lecture. (a) A theoretical and empirical treatment of chemical bonding and molecular structure. (b,c) Systematic treatment of physical-inorganic chemistry based on the principles learned in (a). The b,c sequence is not mandatory. Prerequisite: 461c.

519-2 to 30 (2 to 6 per quarter) Advanced Topics in Inorganic Chemistry. Selected topics such as kinetics of inorganic reactions, stereochemistry of inorganic systems, chemistry of coordination compounds, nonaqueous solvent systems, and others. Prerequisites: 511a and consent of instructor.

531-3 Theory of Quantative Analysis. The phenomena utilized in analytical chemistry with emphasis on separation, organic reagents, and complex methods. Lecture. Prerequisite: 433 or satisfactory field examination.

532-3 Instrumental Methods of Analysis. Theory and practice of instrumental measurements in analysis with emphasis on commercial samples and applications to research. Lecture and laboratory. Prerequisite: 432 or satisfactory field examination.

539-2 to 30 (2 to 6 per quarter) Advanced Topics in Analytical Chemistry. Selected topics such as microanalytical chemistry, absorption spectroscopy, and electroanalytical chemistry. Prerequisite: 432.

541-3 Advanced Organic Chemistry. An advanced course covering covalent bonding, structure, stereochemistry, reactions, reaction mechanisms, substituent effects, correlation of physical and chemical properties, and physical methods in organic chemistry. Lecture. Prerequisite: 504 or field examination.

542-3 Advanced Organic Chemistry. Continuation of Chemistry 541. Lecture. Prerequisite: 541.

543-3 Advanced Organic Chemistry. Continuation of Chemistry 542. Prerequisite: 542.

547-3 to 6 Advanced Laboratory Preparations in Organic Chemistry. Prerequisites: 446 and consent of instructor.

549-2 to 30 (2 to 6 per quarter) Advanced Topics in Organic Chemistry. Specialized topics in organic chemistry. The topic to be covered is announced by the department. Prerequisite: 543.

551-3 Nucleic Acids and Protein Biosynthesis. Proteins and nucleic acids. Three lecture hours per week. Prerequisite: 451c.

552-3 Carbohydrate Chemistry. Simple sugars, oligosaccharides, and polysaccharides. Three lecture hours per week. Prerequisite: 451c.

553-3 Plant Biochemistry. Three lecture hours per week. Prerequisite: 451c.

554-4 Biochemical Mechanisms. Molecular transformations in biochemistry in terms of general mechanistic principles in chemistry. 3 lecture hours per week. Prerequisite: 451c.

555-3 Enzymes. Advanced enzyme chemistry. 3 lecture hours per week. Prerequisite: 451c.

559-2 to 30 (2 to 6 per quarter) Advanced Topics in Biochemistry. Selected topics such as enzymology and physical biochemistry. Prerequisite: 451c.

561-3 Chemical Thermodynamics. Basic methods and theories as applied to chemical problems. Lecture. Prerequisites: 461c or consent of instructor.

562-6 (3,3) Quantum Chemistry. Basic Principles. Lecture. Prerequisite: 464 or consent of instructor.

563-3 Chemical Dynamics. Experimental description and classical theories of the rate of chemical reactions; kinetic theory of non-uniform gases and its application to reacting systems; molecular beam techniques. Lecture. Prerequisite: 461c.

564-3 Statistical Thermodynamics. Elements of statistical mechanics and application to relatively simple systems. Alternates with 563. Prerequisite: 562 or consent of instructor.

569-2 to 30 (2 to 6 per quarter) Advanced Topics in Physical Chemistry. Colloids and macromolecules, quantum chemistry of atoms, diatomic molecules or polyatomic molecules, statistical mechanics and others. Prerequisite: 561.

594-1 to 15 (1 to 6 per quarter) Special Readings in Chemistry. Assigned library work in any of the five fields of chemistry with individual instruction by a staff member. (a) Analytical. (b) Biochemistry. (c) Inorganic. (d) Organic. (e) Physical. Prerequisites: 24 hours of 500-level chemistry and consent of division.

595-0 to 9 Advanced Seminar in Chemistry. Advanced level talks presented by graduate students; (a) analytical, (b) biochemistry, (c) inorganic, (d) organic, and (e) physical chemistry. Prerequisite: consent of chairman.

598-1 to 48 Research. (Graded S/U.) Prerequisite: consent of chairman.

599-1 to 9 Thesis. Prerequisite: consent of chairman.

600-3 to 48 Dissertation—Doctoral. Prerequisite: 598.

Child and Family

408-2 to 8 Workshop. For workers in fields related to child and family.

445-4 Administration of Pre-School Programs. Objectives in pre-school programs. Programming including housing, equipment, health protection, and supervision. Field trip. Prerequisite: 345a, or b, or consent of instructor.

456-4 Infant Development. Current theories and knowledge concerning growth and development of infants with related laboratory and field experiences. Prerequisite: 237 or Psychology 301 or equivalent.

466-2 Practicum in Parent-Child Study. Designed to increase student's ability to work with parents and parent groups through an awareness of factors in the parent-child relationship and knowledge of current research and methods in parent education. Integration with infant and child development laboratories and related field experience. Prerequisites: 227, 237 or equivalent.

471-2 to 6 Field Experience. Supervised learning experiences. Child development experience in a community nursery school. Prerequisite: consent of chairman.

481-2 to 6 Readings. Child development and family living readings under staff supervision. Prerequisite: consent of instructor and chairman.

500-4 Research Methods. The study of principles of research design and basic techniques in child and family research. Prerequisite: Guidance 505, Mathematics 420 or consent of instructor.

556-4 The Pre-School Child. Growth of the child from birth to six years with emphasis on the various aspects of growth and their inter-relationships.

562-4 Child Development through Home and School. The normal, healthy development of children as it takes place in the home and is promoted by the curriculum and other school activities.

566-4 Interpersonal Relationships within the Family. A study of factors that promote satisfactions within the immediate family; planning and preparing teaching units, and source materials in this field.

571-4 Recent Research. Review of selected research in areas of child and family.

572-2 to 8 Special Problems. For qualified students who need to pursue certain topics further than regularly titled courses permit. Prerequisite: consent of chairman.

599-2 to 9 Thesis. Minimum of 5 hours counted toward a master's degree.

Cinema and Photography

403-4 Studio Portraiture. Theory and practice of formal studio portrait photography. Prerequisite: 322.

- 404-4 Environmental Portraiture.** Theory and practice of formal and informal portraiture outside the studio. Prerequisite: 322.
- 405-4 Commercial Photography.** Study and use of studio lighting techniques for commercial photography. Prerequisite: 322.
- 406-4 Advanced Commercial Photography.** Assignments in areas of commercial photography in black and white and color. Prerequisite: 405.
- 407-4 Publications Photography.** Photographic news reporting with emphasis on single pictures and short picture stories. Prerequisite: 322.
- 408-4 Advanced Publications Photography.** Production of picture essays including research, lay-out, captions, and text. Black-and-white and color. Prerequisite: 407.
- 409-4 Picture Editing.** Picture usage and layout and methods of photographic reproduction for the mass media.
- 415-4 Technical and Scientific Photography.** Introduction to photographic methods used in science and research. Prerequisite: 322.
- 418-4 Documentary Photography.** Methods, approaches, and work in documentary photography. Prerequisite: 322.
- 420-4 Experimental Photography.** Experimental approaches to the creation of photographic images. Prerequisite: 322.
- 421-4 to 8 Personal Photographic Expression.** Development of personal vision in photography. Usually taken 4,4. Prerequisite: consent of department.
- 422-4 Advanced Color Photography.** Study and production of color photographs. Emphasis on experimental techniques. Prerequisite: 322.
- 450-4 Film and Society.** Major social issues associated with the cinema. Examination of attempts to regulate and control the medium.
- 456-1 to 6 Workshop in Film Production.** Crew work on university film productions. Prerequisite: consent of department and film production.
- 457-4 Mixed Media Production.** Multi-media theory. Creation and coordination of presentations involving visual and aural media. Prerequisite: consent of department.
- 458-1 to 12 Projects in Cinema and Photography.** Individual or crew projects in motion picture production or still photography. Usually taken 4,4,4. Prerequisite: consent of department.
- 460-4 History of the Silent Film.** Emphasis on the theatrical film to 1929. Screening fee.
- 461-4 History of the Sound Film.** Theatrical film from early experimentation to the present. Screening fee.
- 462-4 History of the Documentary Film.** Documentary film illustrated by the work of representative film makers. Screening fee.
- 463-4 History of the Experimental Film.** Survey of experimentation in cinema from the turn of the century, through the avant-garde periods, to contemporary independent films.
- 470-4 Special Cinematic Forms.** Innovation in technique and content in animated, advertising, and experimental films. Production of short innovative films. Prerequisite: 357 or equivalent.
- 480-1 to 12 Individual Study in Cinema and Photography.** Research in history, theory, or aesthetics. Usually taken 4 per quarter. Prerequisite: consent of department.

Clothing and Textiles

- 432-2 to 8 Workshop.** Designed to aid leaders in the field with current problems. Discussion, reports, lectures, and other methods of analyzing and working on solutions to problems. Prerequisite: consent of chairman.
- 433-4 Advanced Pattern Designing.** Application of flat pattern design principles to the making of patterns for garments of various designs and fabrics. Fitting and pattern alteration related to various figure types. Production cost analysis. Prerequisite: 233 or consent of chairman.
- 434-4 History of Clothing.** Development of clothing from prehistoric times to the present. Social, economic, and aesthetic background. Technical innovations that made possible its design.
- 440-4 Clothing the Family.** Needs and wants of individuals at various developmental stages, in family and societal settings with respect to apparel consumption; functional and fashion-motivated choice of clothing; and family budgets.
- 470-3 Seminar in Clothing and Textiles.** Apparel and environmental-textile

needs of consumers at the level of design room, research laboratory, mill, store, and satisfactory end-use performance. Prerequisite: consent of chairman.

473-4 Advanced Tailoring. The student will tailor one garment for herself. Time-saving methods, high-quality construction details, and professional finishes stressed. Prerequisite: 360 or consent of chairman.

474-4 Advanced Textiles. The physical and chemical analysis of textiles. Problems dealing with standards, labeling, and legislation. Current literature of developments in the field. Prerequisites: 304 or consent of chairman.

481-1 to 6 Readings. Supervised readings for qualified students.

500-4 Research Methods. Study of methods employed in research in clothing, textiles, and interiors. Critique of literature, theses, and research. Development of research design based on interest and need of student. Prerequisite: statistics or consent of chairman.

570-4 Clothing and Textiles Seminar. Selected problems within the field of clothing and textiles.

572-1 to 8 Special Problems. For students recommended by their chairman and approved by the chairman of Clothing and Textiles, and the instructor in charge for independent work or directed study.

582-4 Foundations of Fashion. Anthropological approaches to fashion and socio-economic and psychological forces as determinants of fashion in modern times. Prerequisites: 329 and 339, or consent of chairman.

583-3 (1,1,1) College Teaching of Clothing, Textiles, and Interiors. Central ideas, objectives, and current practices. For preparation of college teachers.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Community Development

401-4 Introduction to Community Development. This survey includes an analysis of the history, values, and techniques of various approaches to community development and explores some of the specific social issues and problems which confront community development practitioners. Prerequisite: 4 hours of sociology or consent of instructor.

402-4 Comparative Community Development. Surveys the historic, economic, organizational, and other aspects of international community development programs under the auspices of world and regional agencies, or of multi-national, national, or local sponsorship, focusing primarily upon specific case studies. Prerequisite: 401, 4 hours sociology, or consent of instructor.

499-1 to 5 Independent Study in Community Development. Supervised study and projects in fitting with the needs of each student. Prerequisite: consent of instructor.

501-4 Small Group Process in Community Development. Review of the literature on small groups and the techniques of working with them. Examines small group processes, ranging from informal personal interaction to formal problem-solving and decision making. Special attention given to problems of communication and to the concept of role. Prerequisite: 401, consent of instructor.

502-4 Community and Change. Classical and modern theories of social change and their relevance and applicability to development problems. Helps students select and adapt these theories to a variety of situations both in this country and abroad. Prerequisite: 401, consent of instructor.

503-4 Problems and Approaches to Community Development. Focuses upon a range of CD problems and models and deals with selected skills necessary to the CD technician. Prerequisite: 401, consent of instructor.

511-4 Laboratory in Small Group Process. Application of CD as a problem-solving method in a small group situation. Problems of establishing goals and reaching them, and problems of power, resources, and decision-making are dealt with in a group setting. Prerequisite: 401, 502 (or parallel), or consent of instructor.

512-4 The Change Agent in Planned Change. Laboratory to parallel the substantive-theoretical content of 502. Utilizes case study, role playing, and participant observation approaches to explore, in depth, relations between theory and practice in the actual processes of community change. Prerequisite: 401 or consent of instructor.

513-4 Laboratory in Consulting Styles and Techniques. Emphasis upon the CD practitioner and how he works. Field consultants, community workers

and organizers, and persons skilled in distinctive approaches to CD are brought into the classroom. Students also observe practitioners in the field and, as individuals or teams, participate in community change projects. Prerequisite: 401, 503, and consent of instructor.

596-1 to 8 Independent Study in Community Development. Independent study under the supervision of a faculty member in the Community Development Institute or work on a terminal research paper or advanced field project. Prerequisite: 401, consent of instructor.

598-4 Research Seminar in Community Development. Helps students planning individual field research projects, especially terminal research projects or master's theses. Prerequisite: 401, or consent of instructor.

599-1 to 8 Thesis Research. Credit is given for a master's thesis when it is accepted and approved by the thesis committee. Prerequisite: 401, 501, 502, 503, 511, and 598.

Computer Science

403-3 Data Structures. Data, strings, stacks, arrays, lists, trees, storage systems and structures, searching and sorting, and list and string processing languages. Prerequisite: 302a.

411-3 Structure of Programming Languages. Introduction to the formal definition of a language. Representation and evaluation of arithmetic expressions. Extensive analysis of the structure of an algorithmic language. Prerequisite: 302a.

414-3 Systems Programming I. Interpretive systems, assemblers, loaders, compilers. Addressing techniques, program segmentation, and linkage. Explicit input-output references. Batch processing systems. Time sharing, multiprogramming, and multiprocessor systems. Prerequisite: 403.

442-3 Discrete Structures. Review of sets, functions, and relations. Algebraic structures including semi-groups, groups, and Boolean algebras. Subalgebras, congruence relations, homomorphisms, and direct products. Elements of graph theory. Applications to various areas of computer science. Prerequisite: Mathematics 301.

445-3 Applied Boolean Algebra. Applications to switching circuits and propositional logic. Circuit simplification, logical circuits, and sequential circuits. Prerequisite: 442.

451-3 Introduction to the Theory of Computation. (Same as Mathematics 451.) Automata, their behavior and basic properties. Turing machines. Examples and applications to computing functions and recognizing sets. The concept of an algorithm. Definition and examples of formal grammars. Prerequisite: 442 and either 445 or consent of instructor.

461-6 (3,3) Numerical Calculus. Algorithms for the solution of numerical problems encountered in scientific research work. Emphasis on the use of high speed, digital computers. Elementary discussion of error, polynomial interpolation, quadrature, solution of nonlinear equations and linear systems, matrix calculations, solution of differential equations. May not be taken for credit by graduate students in computer science or mathematics. Students may not receive credit for both 461 and 464. Must be taken in a,b sequence. Prerequisites: 202, Mathematics 305a, and 221.

464-6 (3,3) Numerical Analysis I. Theory and practice of computation. Emphasis on methods useful with high speed digital computers. Solution of nonlinear equations, interpolation and approximation, numerical differentiation and integration, solution of differential equations, matrix calculations and the solution of systems of linear equations. Students may not receive credit for both 461 and 464. Must be taken in a,b sequence. Prerequisite: 202, Mathematics 305a and 221.

470-3 Theory of Simulation. Methodology, including generation of random numbers and design of experiments. Discrete and continuous models for stochastic processes. Simulation languages. Emphasis on the use of the computer in constructing simulation models. Prerequisites: 202 and either Mathematics 480a or 483a.

472-3 Instruction to Mathematical Programming. Theory of linear programming, game theory, dynamic programming. Prerequisite: Mathematics 421a.

495-1 to 9 Readings. Supervised readings. Prerequisites: consent of instructor and department.

- 514-3 Systems Programming II.** File system organization and management. Process and data modules. Remote and hierarchical job control. Characteristics of large systems. Command languages and interpreters. Commands of a multiprogramming system. Microprogramming. Prerequisite: 414.
- 516-6 (3,3) Compiler Construction.** Review of grammars and languages. Structure of algorithmic languages. Syntactical description, algorithms for translation, string manipulation, formula manipulation. Storage allocation. Organization of a simple complete compiler. Automated compiler design and bootstrapping techniques. Machine independent compilers. Optimization techniques. Prerequisite: 403 and 411.
- 518-3 Large-scale Information Processing Systems.** Data organization and storage structure techniques. Designing best systems by organizing files and segmenting problems into computer programs to make efficient use of hardware devices. Documentation methods and techniques for modifying systems. Prerequisite: 403, 414.
- 527-3 Formal Languages.** (See Mathematics 527.)
- 528-3 Automata Theory.** (See Mathematics 528.)
- 529-3 Theory of Computability.** (See Mathematics 529.)
- 531-3 Information Structure and Retrieval Systems.** Natural language processing on digital computers. Structure of semiformal languages and models for the representation of structured information. Semiautomatic and automatic retrieval systems. Evaluation of retrieval effectiveness. Prerequisite: 403.
- 536-3 Artificial Intelligence and Heuristic Programming.** Combinatorial problems, learning mechanisms, self organizing systems, heuristic programs, and pattern recognition. Prerequisite: consent of instructor.
- 551-3 Automata Theory.** Finite automata, decision problems, regular sets, and derivatives and star heights of regular expressions. Algebraic analysis of automata. Emphasis on semigroup and decomposition theory. Probabilistic automata. Prerequisite: 451.
- 554-3 Formal Languages.** Grammars including regular, context-free, context-sensitive, and type 0 phrase structure. Normal forms, restricted grammars, post productions. The relation between grammars and abstract machines. Decision problems of formal languages. Prerequisite: 451.
- 557-3 Theory of Computability.** Turing machines and recursive functions. Church's thesis. Solvable and unsolvable problems including the halting problem. Recursively enumerable sets. Complexity classification. Prerequisite: 451 or consent of instructor.
- 564-6 (3,3) Numerical Analysis II.** Mathematical and computer-oriented treatment of numerical problems in linear algebra and the solution of ordinary and partial differential equations, integral equations, and boundary value problems. Prerequisite: consent of instructor.
- 590-1 to 18 Special Topics.** Advanced topics from the various fields of computer science. Prerequisite: consent of the instructor.
- 593-1 to 9 Seminar.** Supervised study. Preparation and presentation of reports. Prerequisite: consent of instructor.
- 595-1 to 9 Readings.** Supervised readings. Prerequisites: consent of instructor and department.
- 597-1 to 9 Special Problems.** Individual projects. Prerequisite: consent of department.
- 599-1 to 9 Thesis.** Minimum of 5 hours counted toward a master's degree. Prerequisite: consent of department.

Conservation and Outdoor Education

- 490-4 to 16. Internship in Recreation and Outdoor Education.** Experience in a professional setting. Emphasis on administrative, supervisory, teaching, and program leadership. School, community, industrial, agency, park and forest, and other situations. Not counted toward requirements of a graduate program.
- 510-4 Outdoor Education Workshop.** Leadership development and its place in the school program. Utilization of natural and cultural resources for enrichment of the school curriculum.
- 570-4 Seminar in Recreation and Outdoor Education.** Discussion of individual projects; presentation of research problems and dissertation topics.
- 596-2 to 9 Independent Study.** Study and research in the student's field of interest.

Design

400-0 to 6 Materials and Basic Techniques. Same as 200 and 300.

465f-4 to 16 Research in Product-Shelter Design. Problems dealing with large groups. All problems carried from conception to actual full-scale construction. Development of prototype for mass-production techniques. Small research projects will be developed under grants given to the department. Prerequisite: 12 hours of 366 or its equivalent.

465g-4 to 16 Research in Visual Design. Problems dealing with room-to-eye scale and larger, i.e., posters, car cards, strip film, film, exhibitions, etc. Advanced graphic and photographic technology. Development of prototypes for mass-production techniques. Small research projects will be developed under grants given to the department. Prerequisite: 12 hours of 375 or its equivalent.

490f-2 to 12 Studio in Product-Shelter Design. Special projects developed with adjunct and visiting professors.

490g-2 to 12 Studio in Visual Design. Special projects developed with adjunct and visiting professors.

520-4 to 10 Educational Tool Systems. Designs of specialized instructional tools, including design of learning environments and ancillary support systems for programmed learning.

530-4 to 12 Studies in the Industrial Process. Design of products and product systems utilizing contemporary technology for solutions to significant human needs.

535-4 to 12 Research in Product Design. Studies of specialized needs or problem areas (i.e., equipment for the handicapped, needs of underdeveloped areas, etc.).

540-4 to 12 Studies in Communications Design. Concerned with the over-all systems of human communications, including visual and graphic media.

545-4 to 12 Research in Communications Design. Specialized areas of visual and graphic communication extended through various technical systems. Development of related systems involving the whole range of communications included.

550-2 to 16 Field Study in Design. Design activity (local, national, or international) carried out with a designated faculty member as liaison. Written report assigned and final report required. All projects must have written approval by the chairman and the liaison faculty member.

560-4 to 12 Environmental Control. Selected studies in environ control systems, with particular reference to latest technical advances (i.e., closed ecology and autonomous systems developments) and to contributions in the study of human environment control by other disciplines.

570-4 to 12 Design Science Exploration. Procedural methodology and systems approach to comprehensive anticipatory design science.

575-4 World Ecological Studies. Review and analysis of man's present socio-economic situation in terms of scientific and technological trending-material and energy resources, human ecology networks.

576-4 to 8 Structural Evolution. Structural morphology and relational hierarchies in science and technology. Differentiation and evolution of industrial tool complex: analysis of world service industry networks.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Economics

411-4 Collective Bargaining and Dispute Settlement. Nature, issues, procedures, economic effects. Analysis of actual collective bargaining situations. Prerequisite: 310 or consent of instructor.

416-4 Money and Banking II. Emphasis upon the Federal Reserve System and other banking systems. Prerequisite: 315 or consent of instructor (C); 300 (E).

418-4 Economic History of Europe. A survey of the economic growth of Europe with emphasis upon the development of European agriculture, industry, finance, and international trade since 1750. Prerequisite: 215, or GSB 211a, or consent of instructor.

419-4 Latin American Economic Development. A survey of the resource base of Latin American economic development with special reference to the prob-

lems of transition from an export-import to an integrated industrial economy; monetary policies; problems of economic planning. Prerequisite: 215, or GSB 211a, or consent of instructor.

420-4 Recent Economic History of the United States. Review and analysis of the chief characteristics, trends, and continuing problems of the economy of the United States in the 20th century. Prerequisites: 215.

422-4 Introduction to Economic Development. An analysis of the preconditions, processes, and problems involved in economic development. Both the theory and policy relevant to development, with special emphasis upon the "developing" or "emerging" economies, are stressed. Prerequisites: 215.

425-8 (4,4) Economics in Geography. (Same as Geography 425.) (a) Concepts, symbols, theory, language. Theory and analysis. Elementary mathematics, individual's preferences, production functions, the firm, markets, welfare economics, Pareto Optimality, and externalities. (b) Process, criteria, conditions. Certainty, uncertainty, and intertemporal criteria; public, private, and merit goods and services; multipliers; shadow prices, spatial and regional economic concepts; public expenditure criteria; free market allocation, comprehensive plans, and multiple objectives. Prerequisite: taken in a,b sequence or consent of instructor.

429-4 International Economics. Intensive treatment of the principles of international economics with special emphasis on the classical and modern theories of international trade. Income effects. Balance of payments adjustments. Prerequisites: 215 or consent of instructor.

430-4 Regional Economy. Natural economic regions, governmental action (as in the T.V.A.), local applications. Prerequisites: 215.

431-3 Public Finance II. State and local. Prerequisite: 330 or consent of the instructor.

436-4 Government and Labor. (Same as Government 436.) Labor relations and legislation considering both constitutional and economic aspects. Prerequisite: GSB 211a,b or consent of instructor.

440-4 Intermediate Micro Theory. A more intensive treatment of price theory. Prerequisites: 215 or consent of instructor.

441-4 Intermediate Macro Theory. Basic analytical concepts of the modern theory of aggregative income determination. Prerequisites: 205 or 214 or consent of instructor.

443-4 Senior Seminar in Economics Problems and Policy. Application of the tools of economic analysis to the study of contemporary social problems. Economics graduate students not permitted to enroll in this course. Prerequisite: 440, 441.

450-6 (3,3) History of Economic Thought. The development of economic theory. (a) Ancients to 1850; (b) 1850 to present. Must be taken in a,b sequence. Prerequisites: 215 or consent of instructor.

460-4 Russian Economy. Development of Russian trade, agriculture, industry, government, finance, and standards of living in successive periods in relation to the historical, geographic, economic, and ideological background. Prerequisite: 215, or GSB 211a, or consent of instructor.

462-4 Economic Development of the Middle East. Economic structure of the countries constituting the Middle East; economic, political, social and cultural forces influencing development. Prerequisites: 215.

465-4 Mathematical Economics I. A systematic survey of mathematical economic theory. Conditions of static equilibrium (including stability conditions), dynamic models using difference equations, and linear production models of input-output analysis and activity analysis (linear programming). Prerequisite: 440 and consent of instructor.

467-4 Introduction to Econometrics. Problems in the quantification and testing of economic theories. Introduction to regression analysis. Prerequisite: 308.

471-4 Land Resource Economics. (Same as Forestry 471 and Agricultural Industries 471.) The use of land as an economic variable in production of goods and services; land market; group versus individual conflicts; elementary land resources planning techniques. Prerequisite: 440, or 441, or Agricultural Industries 350, or Forestry 470.

481-4 Comparative Economic Systems. Capitalism, socialism, fascism, and other forms of the economy. Prerequisite: 215 or consent of instructor.

490-4 Workshop in Economic Education. (Same as Education 490.) Designed to assist elementary and secondary school teachers in promoting economic

understanding in the minds of their students through the translation of economic principles and problems into classroom teaching materials.

500-4 to 8 Economics Seminar. A study of a common, general topic in the field of economics, with individual reports on special topics. Prerequisite: 206 or 214 and 215, or consent of instructor.

501-1 to 12 Economics Readings. Contemporary books and periodicals in economics. Prerequisite: consent of department.

502-1 to 6 Readings in Resource Economics. (Same as Forestry 520b and Agricultural Industries 520b.) Directed readings in the field of resource economics. Prerequisite: consent of instructor.

512-4 Seminar in Labor Institutions. Evaluation of theoretical, multi-disciplinary approaches to the employment relationship. Wage theory, the labor market, and collective bargaining are placed in the context of industrial relations as a separate discipline and this approach critically examined. Prerequisite: 411.

517-4 Monetary Theory and Policy. A survey of contemporary monetary theory and related policy issues. Prerequisites: 315 and 541.

520-8 (4,4) Economic Development Theory and Policy. (a) Classical, neoclassical, and modern contributions to the theory of development; theories of underdevelopment. (b) Basic approaches to economic development; laissez-faire; balanced growth; unbalanced growth; role of government; methods of planning; and foreign aid. Must be taken in a,b sequence. Prerequisite: 440, 441.

522-4 Microeconomic Foundations of Labor Markets. The approach is theoretical. Topics include the theory of wage and employment determination, labor mobility, labor market imperfections, the special problems of minority group labor, and trade union issues. Prerequisite: 308, 465.

525-4 Seminar: Economics in Geography. (Same as Geography 525.) Valuation, choice methods, and regional plans and resource systems. Location and space models, opportunity cost, market value, user expenditures, cost analysis, regional and national income and product analysis, economic base analysis, benefit-cost, budgeting, least cost ranking, joint production, and analysis of representative plans, and resource design systems. Prerequisite: 425b or consent of instructor.

526-4 Managerial Economics. (Same as Business Administration 526.) A course in the economics of the firm. Designed to develop a conceptual framework for business decision making with emphasis on demand, costs, prices, and profits. Prerequisites: 214 and 215, or 413, or consent of instructor. Credit may not be earned in both Economics 440 and this course.

530-4 Foreign Trade. Emphasis on the advanced theory of international trade, survey of significant literature in international theory. Study of more advanced tools of analysis. Prerequisite: 429 or consent of instructor.

531-4 International Economics. Application of theory to current international economic developments. Empirical studies. Prerequisite: 429 or consent of instructor.

533-4 Public Finance Theory and Practice. Historical development of public finance theories with analysis of their policy implications. Prerequisite: 330 or consent of instructor.

540-8 (4,4) Microeconomic Theory I and II. Prerequisite: to (a) 440 or consent of instructor, to (b) 540a or consent of instructor.

541-8 (4,4) Macroeconomic Theory I and II. Prerequisite: to (a) 441 or consent of instructor, to (b) 541a or consent of instructor.

543-4 Seminar in Economic Policy. A consideration of departures in the American economy from the principle of resource allocation by the price system, and an attempt to develop principles of economic policy which could serve as guides in efforts to raise living standards and promote economic growth. Prerequisites: 440 and 441 or consent of instructor.

552-4 Seminar in Economic Thought. An exploration of the basic philosophic assumptions which underlie the various types of economic thought with special emphasis upon the historical development of the premises of modern day economic theories. Prerequisite: 450a,b or consent of instructor.

555-4 Seminar in Economic History. An examination of the structural economic changes in various economies throughout the world. Prerequisites: consent of instructor.

562-4 Seminar in Economic Systems. A final, theoretically-oriented examination of economic systems. Includes recent theoretical models; contemporary

changes in major economic systems; the emergence of mixed systems. Relates economic, social, and political systems and evaluates attempts to place economic systems within to context of general systems theory. Prerequisite: 481 or consent of instructor.

566-4 Mathematical Economics II. Linear economic models. Linear programming. Input-Output analysis and general equilibrium models. Prerequisite: 440 or 465, or consent of instructor.

567-8 (4,4) Econometrics I and II. (a) Linear regression analysis as applied to single equation economic models. Problems of least squares, maximum likelihood, and Bayesian estimation techniques in stochastic economic models. (b) Elements of asymptotic distribution theory and estimation techniques in multiple equation economic models. Prerequisite: Mathematics 410a or b, and 567a, or consent of instructor.

570-4 Seminar in Contemporary Microeconomic Theory. An investigation of recent developments and current controversies in economic theory with emphasis on microeconomic problems. Prerequisite: 540b.

571-4 Seminar in Contemporary Macroeconomic Theory. An investigation of recent developments and current controversies in economic theory with emphasis on macroeconomic problems. Prerequisite: 541b.

575-4 Economic Regulation. An analysis of the economic causes and effects of the regulation of agriculture, business, and labor. Prerequisite: 440 or consent of instructor.

581-4 Economics of Welfare. The application of economic theory to the quest for economic welfare. Includes consideration of income distribution, rates of growth, the pricing system, and the role of government. Prerequisite: 440 or equivalent.

582-4 Economic Behavior. A theoretical and empirical study of the behavioral aspects of economics, including the behavior of firms, households, and government. This course draws upon the recent literature of economics and also, on frontier areas, upon directly relevant concepts and findings of related behavioral sciences. Prerequisite: 440 or equivalent or consent of instructor.

583-4 Methodological Foundations of Economics. A systematic analysis of the nature, philosophical content, premises, scope, boundaries, and characteristic methods of economics. The history of economic thought is drawn upon, but major focus is upon the contemporary state of the discipline as well as upon apparent methodological trends. Prerequisites: 440 and 441 or equivalent.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Doctoral Dissertation. Hours and credit to be arranged by chairman.

Educational Administration and Foundations

431-4 History of Education in the United States. An historical study of the problems of American education which have relevance to contemporary education.

432-4 Education and Social Forces. The role of social and cultural forces in the shaping of educational policy in the United States. Emphasis on voluntary associations, political parties, media and mass communication, cultural traditions, and the operation of social forces in other societies.

500-4 Research Methods. Introduction to educational research with practical training in research writing and evaluation techniques in education. Recommended or concurrent enrollment in introductory statistics.

501-12 (4,4,4) Seminar in Educational Administration. The interdisciplinary approach to the study of the theory of educational administration. Open to students in approved sixth year and doctoral programs only. Must be taken in a,b,c sequence.

502-4 Seminar in Comparative Education. Educational ideas and practices of various countries of the world, both Eastern and Western, and their impact upon our culture and education.

502s-4 Seminar in Comparative Education: Soviet Russia. A study of Soviet education in historical, cultural, political, philosophical, and world perspective. Emphasis is on education in Communist morality and the creation of the "New Soviet Man." Includes a consideration of the challenge to American education and the issue of the study of Communism in our schools.

502v-4 Seminar in Comparative Education: Vietnam. The Vietnamese edu-

cational system. Emphasis on the structure, curriculum, teaching methods, and teacher education programs as reflection of cultural objectives, national goals, and subcultural aims.

503-4 Seminar in Philosophy of Education. An interpretation of modern educational problems and trends in the light of basic philosophical viewpoints. Excerpts from the leading philosophical writings are used. Prerequisite: 554 or equivalent.

504-4 Seminar in History of European Education. A survey and interpretation of education in Europe from the Greek era to the present. Stresses the relationship of European to American education.

506-4 Seminar: Curriculum in Relation to American Culture. The effect of historical movements on curriculum in our nation at all ages and grade levels continued on a more intensive basis as applied to present-day curricular patterns. Prerequisite: 560 or consent of instructor.

507-12 (4,4,4) The Twentieth Century and Education. A study of major movements in the contemporary world in terms of their importance for American education. (a) Education and culture, (b) The American way of life, (c) Challenges of the twentieth century.

508-8 (4,4) Interdisciplinary Seminar in Educational Administration. (a) Administrative change resulting from social, cultural, and economic pressures upon educational systems. (b) Relevancy of selected concepts from the behavioral and social sciences to the field of educational administration.

511-12 (4,4,4) Internship Practicum. Theory and practice in educational administration in cooperation with a work experience in an educational setting. Prerequisite: consent of student's program committee.

512-4 Workshop in Adult Education. Problems related to the adult learner, program planning, and methods and materials. For teachers and administrators in adult education programs. Prerequisite: consent of instructor.

520-8 (4,4) Legal Basis of American Education. (a) Exploration of principles of law applicable to public schools and school personnel. (b) Illinois school law. Study of the legal aspects of Illinois public education with principle emphasis on statutory law and its interpretation by the courts. Must be taken in a,b sequence.

524-12 (4,4,4) School Administration. (a) Basic orientation to the field of school administration and to the legal and extra-legal forces affecting public school operations. (b) An examination of the administrative processes as an approach to viewing school administration. (c) An introduction to administrative theory. Must be taken in a,b,c sequence.

527-2 to 4 Current Issues in School Administration. A field laboratory course for principals and superintendents.

533-4 School Buildings. Various phases of physical plant design and maintenance of concern to the school administrator.

534a-4 School Finance. A study of the principles and issues of Public School Finance. Revenues, expenditures, indebtedness, and fiscal controls are dealt with.

534b-4 School Business Administration. Principles and practices governing management of business affairs of a public school system.

534c-4 Educational Application of Electronic Data Processing. Electronic data processing as related to the administrative services and instructional areas of educational institutions.

536a-4 Administrator's Workshop. A special program for the consideration of administrative problems pertinent to superintendents, high school principals, and elementary school principals.

539-4 Community Development through the School. A survey of methods and procedures utilized by school districts to further community development.

554-4 Contrasting Philosophies of Education. Deals both historically and contemporaneously with the ideologies which have developed from different concepts and philosophies of education.

556-8 (4,4) School Supervision. (a) The function of the principal or supervisor in the improvement of instruction. Some activities, methods, and devices for improving the effectiveness of teaching. (b) Seminar in educational supervision. Special research problems in supervision for advanced graduate students. Must be taken in a,b sequence.

560-4 Curriculum. (Same as Secondary Education 561.) Modern practices and procedures in curriculum development, with attention to the professional, social, economic, and other major factors, in curriculum planning.

563-4 School Public Relations. For administrators, supervisors, and teachers.

Analysis and classification of public school news media. Practical experience in writing news releases and feature stories for newspaper and professional magazines.

564-4 Secondary School Principalship. (Same as Secondary Education 564.) Deals with problems met specifically by the high school principal. Emphasizes his role in relation to guidance, curriculum, schedule-making, extra-curricular activities, public relations, budgeting of time, etc. Prerequisite: consent of instructor.

575-1 to 4 Individual Research. Selection, investigation, and writing of a research assignment under the personal supervision of a graduate faculty member in one of the following areas: (a) curriculum, (b) supervision, (c) buildings, (d) finance, (e) school law, (f) comparative education; (g) history of education, (h) philosophy of education, (i) sociology of education, (j) administration. Prerequisite: consent of department chairman.

576-1 to 4 Readings in Administration and Foundations. Advanced reading in a previously identified area of interest. Prerequisite: consent of department chairman.

589-2 to 12 General Graduate Seminar. (Same as Philosophy 589.) For students having special interests in the history of philosophy and the original systematic development of philosophic ideas. Prerequisite: consent of instructor.

591-2 Seminar in Social and Philosophical Foundations. Concurrent with Guidance 590 as part of sequence required of all students who are beginning advanced graduate study for the Doctor of Philosophy degree in education. Prerequisite: advanced standing.

592-4 Doctoral Seminar in Cultural Foundations of Education. An integrated seminar in the cultural foundations of education for doctoral students in education. Prerequisite: 591.

596-5 to 9 Independent Investigation. Field study required of each student working for the sixth-year specialist certificate.

599-5 to 9 Thesis.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Elementary Education

401-2 to 4 Problems in Public School Reading. Requirements: attendance at all sessions of a reading conference, preparation of a paper showing practical applications of theory to the student's own teaching situation.

410-4 Improvement of Instruction in Arithmetic in Kindergarten-Primary Grades. Recent findings and current practices in building a basis for quantitative thinking in early childhood education. Special emphasis upon grade placement of content and of techniques to aid children in understanding of the number system. Prerequisite: Mathematics 210.

411-4 Seminar in Instruction. To assist student teachers and in-service teachers in solving classroom problems. Involves clinical study and discussion of behavioral and learning situations, with special attention to the development of characteristics and needs of students.

413-4 Children's Literature. Emphasizes types of literature, analysis of literary qualities, selection and presentation of literature for children. Not for students who have had English 213. Prerequisite: Guidance 305.

415-2 to 4 Improvement of Instruction in Arithmetic in the Elementary School. Items to be taught, the grade placement of content, newer instructional practices and materials of instruction, and means of evaluating achievement. Prerequisite: Mathematics 210 or consent of instructor.

423-4 Teaching Elementary School English Language Arts. Oral and written communication processes, with emphasis on the structure and process of the English language arts. Specific attention to the fundamentals of speaking English, writing, spelling, and listening. Study of learning materials, specialized equipment, and resources. Prerequisite: 314 and 337, or 316 and 337.

424-4 Teaching Elementary School Social Studies. Emphasis on the structure and process of social studies. Specific attention to developing social studies objectives, planning units, developing a general teaching model, organizing the curriculum, and evaluating behavioral change. Study of learning materials, specialized equipment, and resources. Prerequisite: 314 or 316.

430-3 Workshop in Creative Writing in the Elementary School. Techniques of encouraging creative writing in the elementary school.

431-2 to 4 Education for the Disadvantaged Child. An understanding of culturally disadvantaged children with emphasis on the nonurban poor. Discussion of necessary adjustments of school programs emphasizing early school admission, experimental background, self-concept, language development, and learning style.

433-4 Workshop in Kindergarten-Primary Education. Meets needs of in-service teachers in such areas as curriculum adjustment, remedial teaching, child development, and early childhood education. No credit if student has had 333 or 390.

437-4 Problems in Reading. Practices and trends in the teaching of reading; materials of instruction in reading, particularly remedial materials; techniques and materials for prevention of reading difficulties; diagnosis and remediation of reading difficulties. Prerequisites: senior standing, 337. Not open to students who have had 505.

441-4 An Introduction to Teaching Elementary School Science. Study of content and methods of elementary school science, grades K-8. Emphasis on the materials and strategies for using both traditional and modern techniques of science education. One or more field trips. Prerequisite: 314.

442-4 Analysis and Design of Elementary Science Curricula and Instructional Strategies. Analysis of existing science materials with reference to educational philosophy, learning theory, and instructional design. Emphasis on student development of instructional designs and seminars to critique prepared materials. Field trips. Prerequisite: 441 or consent of instructor.

443-4 Workshop in Social Studies. Material on critical areas of the world not commonly emphasized in elementary social studies. Areas considered: significant geographical concepts, Asia, Africa, Russia, and Eastern Europe. Outstanding specialists in social science present their specialties.

445-4 Parent Involvement in Education. Study of materials, techniques, and resources suitable for use by teachers in helping parents and teachers to understand how they can help each other in the partnership responsibilities of the education of culturally disadvantaged children. Prerequisite: student teaching or consent of instructor.

465-4 Seminar in Psychology of Elementary School Subjects. Psychological principles of learning applied to the mastery of materials used in elementary school subjects. Prerequisites: 314, Guidance 305.

475-2 to 8 Workshop in Elementary Education. Critical evaluation of innovative programs and practices. Acquaints teachers within a single school system, or a closely associated cluster of school systems, with the philosophical and psychological considerations and methods of implementation of new programs and practices in one of the following areas: (a) curriculum, (b) supervision, (c) language arts, (d) science, (e) reading, (f) social studies, (g) problems in elementary education, (h) arithmetic, (j) kindergarten-primary, (k) elementary education, (l) administration and supervision. Prerequisite: 314.

490-2 to 3 Workshop in Economic Education in Elementary Schools. A study of newer programs stressing economic understandings of the social studies in the elementary school.

503-9 NDEA Institute in Reading. Emphasizes newer methods and techniques in teaching reading, research findings and applications, adaptation of methods and techniques to various types of pupils. Critical evaluation of new approaches. Prerequisite: students must be selected in advance.

505-4 Readings in the Elementary School. First course in the reading sequence. Survey of reading problems, aspects of the reading process, modern practices in teaching reading.

507-2 to 4 Readings in Reading. Independent reading; acquaintanceship with the literature and research in reading. Conference periods. Prerequisite: 505 and consent of instructor.

509-4 to 8 Practicum in Reading. For advanced students; teaching demonstrations and evaluations. Each student works with a group of reading disability cases. Prerequisites: 521a,b, and c, and consent of instructor.

510-4 to 8 Seminar: Problems in Reading. Major field content seminar: Problems and practices; comprehensive review and evaluation of research and literature. Each student pursues a problem of his own interest.

514-4 Organization and Administration of Reading Programs. For reading

specialists, principals, supervisors, consultants. Recent trends in elementary and high school reading programs, providing reading instruction for total school population, materials and equipment, in-service training, role of the reading specialist. Problems of class members are studied and discussed. Prerequisites: 461 and 505.

515-4 Special Problems in the Teaching of Arithmetic in the Elementary School. A seminar course which covers important problems in arithmetic in the elementary school. Variable content. Prerequisite: 415 or consent of instructor.

516-4 to 12 Internship in Reading. Culminating experience for doctoral candidates. Each student supervises reading services in his own or cooperating school. Conference periods. Prerequisites: 521a,b,c and consent of instructor.

517-2 to 4 Kindergarten-Primary Practicum. Practical applications of advanced theory in the Laboratory School. Readings and research related to special problems in the kindergarten-primary classroom. Prerequisite: 8 hours of student teaching.

518-2 Supervision of Student Teachers. The function of the supervisory teacher in the student teacher situation. Particular attention to the problem of student teaching in the public schools. A course for present and prospective teachers who wish to be more effective in dealing with student teachers.

519-2 to 4 Readings in Research—Elementary Mathematics. Independent readings. Acquaintance with the research literature in elementary mathematics. Conference periods. Prerequisites: 415, 515.

520-4 Diagnosis and Correction of Elementary Mathematics Disabilities. Causes of mathematical difficulties, observation and instrument procedures, experience in preparing materials for diagnosis and for corrective purposes. Prerequisite: 515 or concurrent registration.

521-12 (4,4,4) Diagnosis and Correction of Reading Disabilities. Causes of reading difficulties; observation and interview procedures; standardized tests, instruments, and informal inventories; analysis techniques; experiences in preparing materials for corrective purposes. Each student diagnoses and treats a reading disability case under supervision. Prerequisites: 505, or concurrent registration with 505, and teaching experience.

525-4 Kindergarten-Primary Seminar. Exploration of research literature on problems in early childhood education. Each student to select problem or problems and to present paper to the seminar. Prerequisite: Educational Administration 500 or equivalent.

537-4 Kindergarten-Primary Reading. A survey of problems in the developmental reading program for the primary grades, followed by extensive study of selected problems. Prerequisite: 337 or consent of instructor.

541-4 Problems, Trends, and Research in Elementary School Science. Emphasis upon identifying problems and trends within elementary school science education and planning for research in this field. Prerequisite: 441 or 442 or consent of instructor.

542-3 to 4 Language Arts in the Elementary School. The practical bearing of investigation and theory on the improvement of current practices in the teaching of the language arts other than reading. Attention given to evaluation of teaching materials in these areas.

543-4 Teaching the Social Studies in the Elementary School. Organization of material for teaching purposes, techniques of classroom presentation, bibliographies or materials, use of audio and visual aids to instruction, and techniques for evaluating student progress. Readings, lectures, and discussions related to required teaching experience.

557-4 The Elementary Principalship. Designed to meet many of the particular needs of persons interested in qualifying for appointments as elementary school principals. Other than the administrative responsibilities of the elementary principal, such topics as the grouping of pupils, the elementary school's program, and personnel are studied.

558-3 to 4 Leadership in Elementary Education. A study of some newer developments in the organization and instruction of the elementary school. Team teaching, a non-graded school, grouping and the impact of newer curricular developments.

559-4 Workshop in Instructional Leadership.

560-4 Kindergarten-Primary Education. A survey of current problems and practices in early childhood education for children from four to eight years of age, with emphasis on wide reading in current research literature. Prerequisite: consent of instructor.

561-4 The Elementary School Curriculum. A critical study of the reorganization, construction, and administration of the elementary school curriculum, and the installation, adaptation, and administration of the revised curriculum.

563-4 Organization of the Elementary School. An analysis of types of elementary school organization with special attention to influence of school organization upon the educational program. Application of research findings to selection and use of materials of instruction. Special consideration to student's professional problems.

564-4 to 12 Internship in Elementary Science Education. For elementary school (K-8) specialists in science education. A minimum of fifteen hours per week for one quarter will be spent in an elementary or middle school. Weekly campus or school-site seminars will be held. Prerequisite: 442 and 541, or consent of instructor.

570-2 to 4 Seminar, Research in Elementary Education. Critical analysis of the most significant research studies in organization, learning, teaching, and curriculum in the elementary education.

575-2 to 4 Individual Research. The selection, investigation, and writing of a research topic, under the personal supervision of a member of the departmental graduate staff, in one of the following areas: (a) curriculum, (b) supervision, (c) language arts, (d) science, (e) reading, (f) social studies, (g) problems in elementary education, (h) arithmetic, (j) problems in kindergarten-primary, (k) elementary education administration and supervision.

596-5 to 9 Independent Investigation. Field study required of each student working for the sixth year specialist certificate. The work should be done in the setting of a school system where the student is employed or where full cooperation is extended. The study involves selecting of the problem, survey of pertinent literature, recording of results, and appropriate interpretations and summarizations.

599-3 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Dissertation. Minimum of 36 hours for the Doctor of Philosophy degree.

Engineering

403-4 Statistical Thermodynamics for Engineers. Principles of kinetic theory and classical statistical mechanics as applied to thermodynamic systems. Discussion of the equilibrium state and laws and properties of thermodynamics with applications to engineering systems. Prerequisite: 300c.

406-3 Introductory Wave Motion. Wave motion in strings, bars, and fluids. Fourier methods. Electromagnetic waves. Prerequisite: Mathematics 252b.

408-3 Bioenvironmental Engineering. The application of microbiological and biochemical principles to various phases of bio-engineering, sanitary engineering, and analysis and design of bioprocesses.

409-3 Engineering Hydrology. Hydrologic cycle and analyses. Infiltration studies, groundwater exploration. Statistical analyses, flood routings. Mechanics of entrainment, movement and deposition of sediment material by moving fluids. Analysis of roughness and sediment transport rate in rivers. Prerequisites: 313b or consent of instructor.

411-3 Design of Engineering Experiments. Engineering data evaluation by application of statistical techniques. Design of engineering experiments. Prerequisite: 222, Mathematics 252a.

412-3 Engineering Practice: Legal Considerations. Legal responsibilities of the professional engineer. The law of contracts with enough emphasis on legal procedure to enable students to understand decided cases. Practice in applying some of the principles through written communications. Prerequisite: senior standing.

413-6 (3,3) Intermediate Mechanics of Fluids. (a) Application of the basic laws of nature to the theory of fluids using the continuum approach. Kinematics of fluid motion using various coordinate systems; and continuity equation. Dynamics of viscous fluid motion; the Navier-Stokes and Energy equations. Solutions to the fundamental system of equations. Introduction to magneto-fluid mechanics. (b) Dimensional analysis. Incompressible irrotational flows. Fundamentals of compressible fluid and isentropic flows, normal and oblique shocks, and Prandtl-Meyer expansions. Turbulence. The application of the equations of motion to turbulent flow fields. Reynolds equations. Production,

convection, and dissipation of turbulence. Prerequisite: 313a,b and Mathematics 305a.

414-3 Mechanics of Soils. Fundamental theories of soil behavior and their application in engineering. Laboratory. Soil-water systems and interactive forces; stress-deformation characteristics; ultimate strength; theory of consolidation; methods for estimating soil deformation. Applications of soil engineering in earth dams, retaining walls, foundations, piles, and underground conduits. Prerequisites: 311a, 313a.

415-9 (3,3,3) Principles of Water Quality Control. (a) Characteristics of water quality, natural and man-made; relationship of quality to use; unit operations of water quality control for municipal and industrial use. (b) Characteristics of waste waters; biological and chemical processes for treatment of sewage and industrial wastes; water quality criteria in stream pollution control. (c) Application of physical, chemical, and biological unit operations and processes to design of waste treatment facilities. Laboratory. Prerequisite: Chemistry 121 and Mathematics 150, or equivalent.

416-8 (4,4) Air Pollution Control. (a) Introduction to emission sources, transport/diffusion, and effect of air pollution. Aspects of social, meteorological, biological, physiological, and chemical relationships plus control methods and economics included. Laboratory. Prerequisite: senior or graduate standing. (b) Engineering control theory, procedures, and equipment related to particulate and gaseous emissions control. Source and atmospheric sampling, and analytical techniques covered. Laboratory. Must be taken in a,b sequence.

417-3 Fundamental Compressible Fluid Flow. Principles of fluid flow. Wave propagation in compressible media, isentropic flow of a perfect gas, normal and oblique shock waves, Prandtl-Meyer expansions, and supersonic aerodynamics. Prerequisite: 313a,b.

420-6 (3,3) Transport Phenomena. (a) Mechanism of heat, mass, and momentum transport on both molecular and continuum basis. Estimation of transport properties. Generalized transport equations in one or three-dimensional system. (b) Analogy of mass, heat, and momentum transfer. Macroscopic balances, operations, penetration theory, simultaneous mass and heat transfer, equilibrium operations. Prerequisite: 302 and 313b.

421-3 Introduction to Systems Theory. Description of physical systems and analysis of system properties and system interaction using a generalized mathematical model. Prerequisite: Mathematics 305b.

422-4 Operations Research and Mathematical Model Formulation. Applications of digital computers to the mathematical modelling of physical systems with particular emphasis on the simulation and problem solving techniques of operations research. Dynamic models of transportation, allocation, and replacement. Physical applications and computation techniques related to the theory of games. Prerequisites: 222 and Mathematics 150b or consent of instructor.

423-3 Hybrid Computation. The simultaneous use of the analog and the digital computer for the solution of engineering problems. Scaling of problems. Block diagrams and logic are stressed. Linear and nonlinear differential equations. Simulation as well as iterative analog computation are covered. Prerequisite: 222, 432 or equivalent.

426-3 Communications Theory. Fourier spectral analysis, sampling theory, modulation, multiplexing, random signal theory, signal-to-noise ratio, and basic information theory. Prerequisite: 336-4.

428-1 Water Quality Laboratory. Measurements of water quality parameters performed. Use of modern instrumental techniques demonstrated. Prerequisite: 415a.

430-1 to 8. Special Problems in Engineering. Consists of topics and problems selected either by the instructor or by the student with the approval of the instructor. Prerequisite: senior standing in engineering and consent of the instructor.

431-6 (3,3) Analog and Digital Computer Design. Introduction to the design of analog and digital computers. Subject includes: operational amplifiers, multiplying circuits, regulated power supplies, 3 column algebra, switching circuits, memory devices. Not a course in programming. Prerequisite: 336.

432-3 Analog Computation in Engineering Design. An introduction to the theory and operation of an analog computer. Applications to engineering design, simulation, and optimization. Laboratory. Prerequisite: Mathematics 305a.

434-4 Electronic Design. Applications of electronic circuits including wide band

amplifiers, oscillators, modulation and detection, power amplifiers and digital circuits. Device models studied include high frequency, y parameter, T-equivalent, and Beaufoy-Sparkes charge control. Introduction to computer-aided techniques. Laboratory. Prerequisite: 336.

436-3 Control Theory. Develops and makes use of the students' knowledge of electrical systems. Topics include Laplace transforms, stability conditions, compensation techniques, and state variables. Prerequisite: 439a.

437-4 Microwave Theory and Measurements. Theory of passive microwave devices for guiding, storing, coupling, or radiating electromagnetic energy. Theory of active and non-linear devices including klystrons, circulators, and isolators. Microwave measurements. Prerequisite: 338.

438-3 Electronic Devices. Semiconductor, magnetic, dielectric, and vacuum devices with wide range of engineering applications. Develop understanding of the mechanisms of operation. Prerequisite: 311c, 336.

439-6 (3,3) Transient Analysis and Network Theory. (a) Transient analysis of linear electric networks and analogous systems by means of differential equations and Laplace transforms. (b) One- and two-port networks, reactive, ladder, T and Pi networks, Foster and Cauer forms, and m- and k-derived filters. Prerequisite: 335 and Mathematics 305a.

440-6 (3,3) Structures. (a) Analysis of statically determinate and statically indeterminate structures. Deflections. Slope deflection. Moment distribution. (b) Principles of structural design. Loads. Influence diagrams. Structural materials. Types of structures and their behavior. Safety. Social and environmental conditions. Prerequisite: 311a.

441-6 (3,3) Intermediate Mechanics of Vibrations. (a) Equations of motion applied to systems with free and forced vibrations, damping, and multiple-degrees of freedom; Euler equations; introduction to Lagrange's equations and orbital mechanics. (b) Lograngian equations for conservative and non-conservative systems; eigenvalues and natural modes; numerical methods for eigenvalue determination in higher order systems; special functions.

442-4 Structural Design-Metal. Rational, empirical, and practical basis for design of metal structures with emphasis on structural steel and aluminum. Behavior of members and their connections. Prerequisite: 440a or consent of instructor.

443-6 (3,3) Engineering Design. Projects. Student selects a problem, defines and designs the various subsystems and interface requirements, integrates the subsystems into the final design, and documents the design effort. Laboratory. Must be taken in a,b sequence. Prerequisite: senior standing in engineering.

444-4 Design of Reinforced Concrete. Ultimate strength and behavior of reinforced concrete members. Prerequisite: 311a.

446-6 (3,3) Energy Conversion. Theory of energy conversion devices and processes. Conventional rotating machines, and direct energy conversion devices such as photovoltaic, thermoelectric, and thermionic generators, fuel cells, and magneto hydrodynamic generators. Present development and application, future potential. Prerequisite: 335, 338.

447-3 Intermediate Mechanics of Materials and Structures. Stress and strain at a point in three dimensions. Theory of elasticity. Shear center; unsymmetrical bending; curved beams; elastic foundations; thick walled cylinders; theory of failures; energy methods. Prerequisite: 311a.

448-4 Experimental Stress Analysis. Theoretical and experimental methods of determining stresses and strains; use of optical, electrical, and mechanical instrumentation; relation of modeling and prototype; brittle coating; electrical resistance gages; photo-elasticity. Prerequisite: 311a.

449-3 Intermediate Dynamics. Kinematics and kinetics of three-dimensional motion; Coriolis' acceleration' rigid body motion; Euler's equations; work and energy; gyroynamics; generalized coordinates; impulse-momentum principle; vibrations; computer applications. Prerequisites: 260c and Mathematics 305a.

450-4 Fundamentals of Reactive Systems. Chemical processes, stoichiometry, properties of gases, solution chemistry, modern techniques of analysis, surface chemistry. Non-ideal systems, rates and mechanisms of industrial processes. Instrumentation and process control. Laboratory. Prerequisites: 300a and Chemistry 121b.

451-3 Numerical Methods in Mechanics. Application of numerical techniques to problems encountered in engineering mechanics. Prerequisite: 222, 311a, 313b or concurrent enrollment, and Mathematics 305a or consent of instructor.

455-3 Engineering Geology. (Same as Geology 455.) Engineering problems

encountered by man in dealing with geology and ground water. It will include studies of earthquake effects, land subsidence, landslides, pore water pressures, and methods of coping with these. Field trip required. Prerequisite: Geology 220 or consent of instructor.

458-3 Photoelasticity. Optics related to photoelasticity, theory of photoelasticity, photoelastic model materials, analysis techniques, three-dimensional photoelasticity, birefringent coatings, application of photoelasticity methods. Prerequisite: 448 or consent of instructor.

462-6 (3,3) Matrix Methods in Structural Analysis. (a) Review of matrix algebra. Displacement method of analyzing trusses, continuous beams, and rigid frames with and without sidesway. (b) Force method of analysis. Direct element method of analyzing trusses, rigid frames, and plane grids. Prerequisite: 311a.

463-6 (3,3) Introductory Instrumentation. (a) Characteristics and techniques in analog and digital instrumentation; transducers; signal conditioners; output and display systems; recorders. Laboratory. (b) Ultrasonic techniques; fringe patterns, Fresnel and Schlieren lenses, Moire patterns, pattern enhancement methods, optical systems. Laboratory. Must be taken in a,b sequence. Prerequisite: 336.

464-3 Intermediate Materials Science. Internal structure, treatment, and properties of metals and intermetallic compounds. Theory of dislocations in metals. Plastic flow, phase transformations, martensitic transformation, and X-ray diffraction identification of metallic phases. Prerequisite: 311c.

466-4 Prestressed Concrete. Theory and design of prestressed concrete simple beams, continuous beams and shells. Deflections. Behavior. Prerequisite: 311a.

480-9 (3,3,3) Engineering Process Design. (a) Application of the fundamentals of conduction, convection, and radiation heat transfer. Combined mode and transient heat transfer. Design of equipment using simultaneous heat and mass transfer. (b) Applications of the fundamentals of mass transfer. Consideration of rate controlled, equilibrium, and mass transfer operations. (c) Original design of a process and determination of process variables and equipment. Analysis of construction cost. Prerequisite: 300c, 302.

500-3 Convection Heat Transfer. Forced convection momentum and heat transfer in tubes and over external surfaces. Laminar flow and turbulent flow. Prerequisite: 420a, 431a, or consent of instructor.

501-3 Radiation Heat Transfer. Fundamentals of thermal radiation for diffuse and specular-diffuse systems. Applications to engineering systems. Prerequisite: 302 and, Mathematics 305, or consent of instructor.

502-3 Conduction Heat Transfer. Principles of conduction heat transfer with emphasis on applications to engineering systems. Steady state and transient conduction using classical methods and numerical and analog computation. Prerequisite: 302 or consent of instructor.

503-6 (3,3) Heating and Cooling Systems. (a) The applications of heating and cooling to engineering systems. (b) The design of various systems, including automatic controls. May be taken in any sequence.

508-3 Industrial Waste Treatment. Theories and methods of treating and reducing industrial wastes. Case studies of major industrial waste problems and their solutions. Prerequisite: 451b.

509-3 Advanced Biological Waste Treatment. Investigation of the traditional biological treatment processes utilized in the treatment of municipal and industrial wastes. Prerequisite: 415b or consent of instructor.

510-9 (3,3,3) Electromagnetic Fields. Static boundary value problems; conformal transformation; Schwartz-Christoffel transformation; harmonics; application of Maxwell's equations to plane waves in dielectrics and conductors, antennas, and radiation. Prerequisite: consent of instructor.

511-6 (3,3) Quantum Electronics. An introduction to quantum theory with applications taken from the field of electronics. A study of plasmas, fusion, atomic structure, superconductivity from a theoretical engineering view. Prerequisite: consent of instructor.

512-8 (4,4) Continuum Mechanics. (a) Definition of a tensor. Tensor algebra, special tensors, tensor derivatives, differential geometry, kinematics and dynamics. Tensor quantities in continuum mechanics, stress, strain. (b) Measures of stress and strain. Equations of equilibrium, constitutive equations, compatibility equations. Strain energy functions, linear theory of classical elasticity, special examples, stress functions and general four-function method. Prerequisite: Mathematics 305.

513-3 Mechanics of Viscous Fluids. The complete system of equations for laminar flow of a viscous fluid using the continuum approach, the stress and rates-of-deformation tensors, exact solutions to various boundary value problems, creeping motion, boundary layer theory, introduction to hydrodynamic stability, Orr-Sommerfeld equations, statistical theories of turbulence. Prerequisite: 413a,b or consent of instructor.

514-3 Mechanics of Inviscid Fluids. A study of stream functions, the velocity potential, Euler equations, Bernoulli equations, various solutions to Laplace's equation, added masses, Taylor theorem, Blasius and Kármán theorems, two-dimensional irrotational flows, Cauchy-Riemann equations, conformal mapping, vortex flow, thin airfoil theory, and free-streamline flows. Prerequisite: 413a,b or consent of instructor.

515-3 Wave Motion in Fluids. A study of surface waves in liquids, group velocity and dispersion, shallow water waves, wave makers, sound waves, the method of characteristics, waves in a gas of variable density, shock waves, waves in a rotating fluid. Prerequisite: 413 a,b or consent of instructor.

516-4 Water Resources Development. (a) Engineering aspects of porous reservoir systems. Solid reservoir structure. Porous medium physics. Description of reservoirs. Reservoir fluids including physics and chemistry of water and hydrocarbons.

517-12 (4,4,4) Analysis and Design of Engineering Systems. (a) Application of general system concepts to wide range of physical and engineering processes. Emphasis on variable flow of matter, energy, entropy, and information directed toward predicting performance for specified designs. Introduction of central theme of functional reticulation into multiported elements. Systematic study of relations and interactions in terms of logical operations, transformations, matrices, ordinary and partial differential equations, signal flow graphs, block and bond diagrams, analogies, and computing systems. Lectures and problems work cover electrical, mechanical, fluid, thermal, chemical, nuclear and biological systems. (c) Emphasis on the synthesis and design of systems assembled from multiported primitives to accomplish specific tasks and functions. Particular attention given to the use of analog and digital computers as electronic models for studying alternative designs and modes of operation. Lectures and problems dealing with stochastic processes and variables in both frequency and time domains, and with stationary and nonstationary parameters. Substantial portion of time allotted to original studies on a team basis using available electronic computers. (c) Advanced engineering systems designs. Prerequisite: graduate standing.

518-3 Introduction to Turbulence. Application of the basic equations of motion to turbulent flow problems. Introduction of the correlation concept along with the macro- and micro-scale of turbulence. Isotropic turbulence. Methods and techniques used in the experimental study of turbulence. Prerequisite: 413a,b or consent of instructor.

519-3 Boundary Layer Theory. Boundary layer equations. Laminar and turbulent boundary layers. Classical turbulent flow theories. Two and three dimensional wake and jet flows. Prerequisite: 413a,b or consent of instructor.

520-6 (3,3) Reaction Engineering and Rate Processes. (a) Chemical kinetics of homogeneous and heterogeneous reactions. Kinetic theories, mechanism and mathematical modeling. Interpretation of kinetic data. (b) Introduction of reactor design. Ideal reactors for batch and flow system. Design for multiple reactions. Temperature and pressure effects. Nonisothermal and nonadiabatic processes. Prerequisite: 420 or consent of instructor.

521-3 Solid Waste Collection and Disposal. Basic concepts and theory of solid waste collection and disposal systems. Prerequisite: graduate standing.

522-3 Advanced Topics in Operations Research. Linear programming computational techniques and their applicability to particular operations research models. Topics include the approximation methods, forecasting and optimization techniques, constrained and bounded problems. Problem solution by use of a digital computer is emphasized. Prerequisite: 422.

525-3 Small Particle Phenomena. Small particle formation, behavior, properties, emission, collection, and analysis. Includes atomization, combustion, transport of suspensions, filtration, light scattering. Prerequisite: graduate standing.

530-6 (3,3) Separation Processes and Equilibrium Operations. (a) Phase equilibrium, multistage calculations in concurrent and counter-current opera-

tions, graphical methods, unsteady state stagewise operations. (b) Multi-component systems, solution chemistry, nonideality in phase equilibrium, race separation processes, applications in processing industry. Prerequisite: consent of instructor.

535-6 (3,3) Network Analysis and Synthesis. Advanced analysis and synthesis of electrical networks. Driving point impedance and transfer functions; properties and testing of positive real functions; Hurwitz polynomials; Foster's and Cauer's driving point synthesis of RL, RC, LC networks. Synthesis using methods of Brune, Bott and Duffin, Darlington, approximation problems and techniques, two part synthesis for ladder lattice and constant resistance filters, Butterworth and Chebyshev filters. Prerequisite: 439a or consent of instructor.

542-3 Theory of Plates. Analysis of bending, buckling, and vibration of plates of various shapes; slabs and membranes; complex variables method; linear and non-linear behavior; refined theories; theory of bending of anisotropic and nonhomogeneous plates. Prerequisite: Mathematics 305, or 407, or consent of instructor.

540-3 Elastic Stability. Bending of bars under simultaneous action of axial and lateral loads; buckling of compressed bars, frames, rings, and tubes; lateral buckling of beams; torsion of I beams; buckling of thin plates. Prerequisite: Mathematics 305, or 407, or consent of instructor.

544-4 Plastic Analysis of Structures. Methods of analysis, elastic-plastic deformations, general loading, and direct procedures of design of beams and framed structures. Prerequisite: consent of instructor.

550-3 Advanced Compressible Fluid Flow. Compressible fluid flow in topics such as: supersonic aerodynamics; flow with friction; heat addition or heat loss; real gas effects; method of characteristics; rarefied gas dynamics; and multidimensional flow.

561-6 (3,3) Advanced Vibrations. (a) Emphasis on nonlinear vibrations. Topics to include phase plane, nonlinear conservative systems, problem of rotating pendulum limit cycles of Poincaré, van der Pol equation, method of isoclines. (b) Liapounov stability criteria, bifurcation theory, perturbation methods, almost periodic oscillations, asymptotic methods for autonomous and non-autonomous systems. Prerequisite: Engineering 441, Mathematics 305b.

570-2 to 6 Special Investigations in Engineering. Advanced engineering topics or problems. Prerequisite: graduate standing in engineering.

580-1 to 9 Seminar. (Same as Applied Science 580.)

599-1 to 9 Thesis.

Engineering Technology

403-12 (4,4,4) Electronics Technology. Characteristics and applications of semiconductor devices. (a) Fundamental theory and operation of semiconductor diodes and bipolar transistors, incremental models for transistors, biasing, stability, and feedback of single and multistage amplifiers. (b) Parameters and applications of field effect transistors, optoelectronic devices, thyristors, uni-junction transistors, and amorphous semiconductors. (c) Parameters and applications of operational amplifiers, linear integrated circuits, monolithic voltage regulators, and digital integrated circuits. Laboratory. Prerequisite: 304.

415-3 Basics of Concrete Structural Design. Analysis and design of basic reinforced concrete structural elements using ACI design handbooks. Consideration of working stress and ultimate strength design. Not for graduate credit. Prerequisite: 311b, 315.

416-3 Basics of Structural Steel Design. Analysis and design of simple structural elements and connections for steel buildings and bridges. Use of AISC code. Laboratory. Not for graduate credit. Prerequisite: 311b, 315.

424-9 (3,3,3) Power Systems Technology. (a) Energy sources; fuels and combustion; pollution control in power plants; and the various types of power plants. (b) Steam and gas turbine power cycles; performance and construction details of turbines. Heat balances on power plants. (c) Power plant auxiliaries including condensers, feedwater heaters, blowers; construction details of auxiliary equipment. Not for graduate credit. Prerequisite: 313b or concurrent.

426-9 (3,3,3) Photogrammetry. (a) Cameras and photography; flight planning; mathematical principles of vertical and tilted aerial photographs; ground control methods; extension of control; stereoscopy and parallax; basic instruments, stereo plotters, and latest developments. (b) Rectification

of tilted photographs; stereoscopic plotting instruments; principles and use of oblique photography; analytic photogrammetry and new concepts. (c) Analysis of aerial photographs to determine soil and rock formations and their properties; interpretations for engineering and regional planning purposes. Laboratory. May be taken in a,b or a,c or a,b,c sequence. Prerequisite: 363 or consent of instructor.

430-1 to 8 Special Problems in Industry and Technology. (Same as Applied Science 430.)

437-9 (3,3,3) Communications Systems Technology. (a) Two-port networks and transmission lines. Simulated LF and UHF transmission lines demonstrate traveling wave phenomena. (b) Microwave devices and transmission through waveguides. Microwave laboratory. (c) Design of communication subsystems, signal analysis, bandwidth, and Fourier Series covered. Laboratory includes design and construction of circuits used in communication systems. Prerequisite: 304.

438-11 (4,4,3) Design of Control and Digital Systems. (a) Fundamentals of control systems: equations of electrical, mechanical, hydraulic, and thermal systems; applications of Laplace transforms, transfer functions, block diagrams, and flowgraphs. Analog computation laboratory. (b) Basic graphical design methods: root locus, frequency response, Nyquist diagrams, and compensator design. Control systems laboratory. (c) Design of digital systems: logic operations, number systems, and applications. Prerequisite: 304.

English

400-4 Introduction to English Linguistics. Methods of structuralizing: phonetics, phonemics, morphemics, syntax. Especially recommended for students preparing to teach English to native speakers.

402-4 Old English Literature in Translation. A study of prose selections from Bede, Aelfric, and other writers, and of poetry from the simplest riddles and gnomic verses to the complex forms of the Caedmonic and Cynewulfian schools, the elegaic poems, and *Beowulf*. Emphasis is on the literary and cultural significance of works studied.

403-4 History of the English Language. A survey of the development of the language from Indo-European to modern English with special emphasis on Middle and Early Modern English changes.

404-12 (4,4,4) Middle English Literature. (a) Middle English literature excluding Chaucer; (b) Chaucer: early poems and *Troilus*; (c) Chaucer: *Canterbury Tales*. May be taken singly.

410-4 Literature for the Adolescent. Criteria for evaluation of literary materials for junior and senior high school, with emphasis on critical approaches in selection of literature.

412-20 (4,4,4,4,4) English Nondramatic Literature. (a) 16th century. (b) 17th century. (c) The age of Dryden. (d) The age of Pope. (e) The age of Johnson.

417-4 Black Literature. Special studies in Black literature, American and African. Emphasis on contemporary Black expression.

418-4 English Literature, 1885-1914. Poetry, drama and fiction of the later Victorian and early modern period.

420-8 (4,4) American Poetry. (a) Trends in American poetry to 1900 with a critical analysis of the achievement of the important poets, (b) the important poets since 1900. May be taken singly.

421-16 (4,4,4,4) English Poetry. (a) Early Romantics: major emphasis on general background and on Blake, Coleridge, and Wordsworth; (b) later Romantics: emphasis on Byron, Shelley, and Keats, the minor figures; (c) Victorian poets: Tennyson, Browning, Arnold, and other poets of England, 1830-1900; (d) modern British poets. May be taken singly.

425-4 Modern Continental Poetry. Representative poems by the major 20th century poets of France, Italy, Germany, Spain, Russia, and Greece.

431-12 (4,4,4) Major American Writers. Significant writers of fiction and nonfictional prose from the Puritans to the 20th century: (a) 1620-1800, (b) 1800-1865, (c) 1865-1915. May be taken singly.

438-4 Intellectual Backgrounds of American Literature. The relationship of basic ideas in America to American literature.

442-4 Romantic Prose. Fiction of Austen Scott, Mary Shelley, Peacock, the

Gothic novelists; prose of Lamb, Landor, Hazlitt, DeQuincey; criticism, journals and letters.

443-4 Victorian Prose. The chief writers of nonfictional prose from the late Romantics to 1880.

454-12 (4,4,4) English Fiction. (a) 18th century: Defoe through Jane Austen, (b) Victorian novel: 1830-1880, (c) 20th century. May be taken singly.

456-4 Modern Continental Fiction. Selected major works of European authors such as Mann, Silone, Camus, Kafka, Malraux, Hesse.

458-8 (4,4) American Fiction. (a) The novel in America from its beginning to the early 20th century, (b) trends and techniques in the American novel and short story since 1914. May be taken singly.

460-16 (4,4,4,4) British Drama. (a) Elizabethan drama: from the beginning of the drama in late Middle Ages through its flowering in such Elizabethan playwrights as Greene, Peele, Kyd, Marlowe, Heywood, Dekker, but excluding Shakespeare; (b) Jacobean drama: the Jacobean and Caroline playwrights: Jonson, Webster, Marston, Middleton, Beaumont and Fletcher, Massinger, Ford, Shirley; (c) Restoration and 18th century drama: after 1660, representative types of plays from Dryden to Sheridan; (d) Modern British drama.

464-4 Modern Continental Drama. The continental drama of Europe since 1870; representative plays of Scandinavia, Russia, Germany, France, Italy, Spain, and Portugal.

468-4 American Drama. The rise of the theater in America; with readings of plays, chiefly modern.

471-8 (4,4) Shakespeare. (a) The plays before 1600. (b) The plays of 1600 and later. Readings on the life of Shakespeare, the theater, and the acting companies. May be taken singly.

473-4 Milton. Reading of *Paradise Lost*, *Paradise Regained*, *Samson Agonistes*, minor poems, major treatises.

485-4 Problems in the Teaching of English. Aims, methods, materials, tests, programs, and other aspects of English instruction in the high school.

486-2 to 8 Workshop in High School English. Intensive study in lectures, laboratory, and conferences, on the teaching of English in high school. Curriculum, materials, methods, aims.

487-2 to 8 Workshop in Junior High School English. Intensive workshop study in lectures, laboratory, conferences on the teaching of English in junior high school. Curriculum, materials, methods, and aims. Directed by competent authorities in the field.

492-8 (4,4) Professional Writing II.

493-4 Special Problems in English. Topics vary and are announced in advance; both students and faculty suggest ideas. May be repeated for a maximum of eight quarter hours provided registrations cover different topics. Prerequisite: consent of instructor.

494-4 Literature in Society. An analysis of the structure and function of literature as a social institution.

495-8 (4,4) Literary Criticism. (a) History of criticism: ideas and techniques from Aristotle to the end of the 19th century, (b) modern criticism: recent critics and critical attitudes, and practice in writing criticism. Open only to seniors and graduate students.

497-12 (4,4,4) Senior Honors Seminars. (a,b) Topics will vary yearly. (c) Honors readings. Enrollment restricted to undergraduates. Departmental approval required.

499-2 to 8 Readings in English. For English majors only. Departmental approval required. No more than four hours may be taken in any one quarter.

500-2 Materials and Methods of Research in English. The principal tools of literary scholarship and the more important studies and journals. Practice in the preparation of selective bibliographies and scholarly reports.

501-4 Old English Grammar. The development of the forms, the grammar, and readings.

502-4 Beowulf. Readings of the poem and study of its form, language, and history. Prerequisite: 501.

506-4 Old Norse.

508-4 to 12 Studies in Chaucer. Prerequisite: consent of department.

509-4 to 12 Studies in Middle English Literature. Prerequisite: consent of department.

511-4 to 12 Studies in the Renaissance. Prerequisite: consent of department.

513-4 to 12 Studies in 17th Century Literature. Prerequisite: consent of department.

- 514-12 to 24 Studies in Restoration and 18th Century Literature.** (a) Restoration literature. (b) Early 18th century literature. (c) Later 18th century literature. Prerequisite: consent of department.
- 518-4 to 12 Studies in English Literature, 1885-1914.** Prerequisite: consent of department.
- 519-4 to 12 Studies in Contemporary British Literature.** Prerequisite: consent of department.
- 520-4 to 12 Studies in Romantic Writers.** Prerequisite: consent of department.
- 521-4 to 12 Studies in Victorian Poetry.** Prerequisite: consent of department.
- 524-4 to 12 Studies in the Metaphysical Poets.** Prerequisite: consent of department.
- 532-4 to 12 Studies in American Transcendentalism.** Prerequisite: consent of department.
- 534-4 to 12 Studies in Early 19th Century American Writers.** Prerequisite: consent of department.
- 536-4 to 12 Studies in Later 19th Century American Writers.** Prerequisite: consent of department.
- 537-4 to 12 Studies in 20th Century American Writers.** Prerequisite: consent of department.
- 538-4 to 12 Problems in American Literature.** Prerequisite: consent of department.
- 543-4 to 12 Studies in Victorian Nonfiction Prose.** Prerequisite: consent of department.
- 555-4 to 12 Studies in the Victorian Novel.** Prerequisite: consent of department.
- 560-4 to 12 Studies in Renaissance Drama.** Prerequisite: consent of department.
- 566-4 to 12 Studies in Shakespeare.** Prerequisite: consent of department.
- 579-4 to 16 Studies in Modern Literature.** Prerequisite: consent of department.
- 580-4 Traditional Themes.** Persistent themes and legends in literature—King Arthur, Faust, Utopia, and the like. Prerequisite: consent of department.
- 581-12 (4,4,4) Problems in Teaching English.** (a) Composition. (b) Linguistics. (c) Literature. Prerequisite: consent of department.
- 585-2 Teaching College Composition.** Objectives, methods, and materials for the course; observation; and practice under supervision. Prerequisite: consent of department. Now graded S/U only.
- 593-4 Special Problems in English.** Topics vary and are announced in advance; both students and faculty suggest ideas. May be repeated for a maximum of twelve quarter hours provided registrations cover different topics. Prerequisite: consent of instructor.
- 594-8 (4,4) Studies in Literary Form and Symbolic Action.** Prerequisite: consent of department.
- 596-4 Stylistics.** Defines style and its workings throughout literary history, applies the methods of modern analyses to literary works in English, shows how natural and artificial modes (genre and period definitions, metre, etc.) relate to literary artifacts and to the situation of the work of art vis a vis the civilization that engendered it.
- 598-1 to 6 (1 to 3, 1 to 3) Review of English and American Literature.** Restricted to master's degree students. Now graded S/U only.
- 600-1 to 48 Dissertation.**

Family Economics and Management

- 407-2 to 8 Workshop.** Aids workers in professions related to family economics and management. Emphasis will be stated in the announcement.
- 423-4 Advanced Family Housing.** Further appreciation and understanding of aesthetic, economic, psychic, and social factors influencing choice of family housing today. Prerequisite: 323 or consent of instructor.
- 424-4 Selection, Use, and Care of Appliances.** Materials used in equipment, methods of construction, and principles of operation of appliances for cooking, refrigeration, laundering, cleaning; selection, operation, and care of appliances to obtain maximum satisfaction in use. Offered on demand. Prerequisite: 324 or consent of instructor.
- 435-4 Work Simplification in Home Management.** Basic scientific work simplification principles applied to work done in the home by full-time, employed or physically handicapped homemakers.

471-2 to 6 Field Experience. Opportunity for supervised learning experiences in selected areas. Prerequisite: consent of chairman of department.

481-2 to 6 Readings. Supervised readings for qualified students. Prerequisite: consent of instructor and chairman.

500-4 Research Methods. Scientific method and basic techniques in home and family research as applied to the collection, analysis, and interpretation of data. Prerequisite: Guidance 505.

540-4 Trends in Consumer Problems. Social, legal, and economic problems that pertain to the consumer. Selection of individual problems for investigation. Prerequisite: 341 or equivalent.

550-4 Advanced Home Management. Readings, observations, projects, and discussions. Emphasis on time, money, energy, and family relations. Prerequisite: 331 and 332 or equivalent.

571-4 Recent Research. Review of research in home economics and related fields. Sources include colleges, universities, and governmental and industrial agencies. Offered on demand.

572-2 to 8 Special Problems. For students recommended by their chairman and approved by the head of the department and the instructor in charge for independent work or directed study.

599-2 to 9 Thesis.

600-3 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Finance

421-4 Management of Business Finance. The principal problems of managing the financial operation of an enterprise. Emphasis upon analysis and solutions of problems pertaining to policy decisions. Prerequisite: 320.

422-4 Advanced Financial Management. The development of ability to use sophisticated analytical tools by the discussion of case situations dealing primarily with capitalization, return on investment, and cost of capital. Prerequisite: 421.

430-4 Business Finance. An introductory course combining both a description of the structure of business financing and an analysis of functional finance from a managerial viewpoint. Restricted to graduate students.

473-4 Government Regulation of Business. Social and economic assessment of environmental factors influencing business policies and strategies. Emphasis is placed on legislation affecting competition and allocation of the firm's products and resources. Prerequisite: senior standing.

475-4 Forecasting and Budgeting. Methods and problems associated with the development of data used in planning financial activities. Prerequisite: 320.

480-4 International Financial Management. Financial behavior of multinational firms. Emphasis on the modifications of conventional financial models to incorporate uniquely foreign variables. Prerequisite: 320 and Economics 315.

Food and Nutrition

420-3 Recent Developments in Nutrition. Critical study of current scientific literature in nutrition. Prerequisite: 320 or equivalent. Offered alternate years.

421-3 Recent Trends in Food. Critical study of current scientific literature in food. Prerequisite: 320 or equivalent. Offered alternate years.

481-2 to 4 Readings. Supervised readings for qualified students. Prerequisites: 320 or consent of instructor and department chairman.

490-3 Nutrition and Growth. Lectures, readings, and discussion on nutrition in relation to human growth. Prerequisite: 320 or equivalent. Offered alternate years.

500-4 Research Methods. Study of methods employed in research in food and nutrition. The development of a research design selected on the basis of the interest and need of the student. Field trip. Prerequisites: 420, 421, or equivalent and statistics. Offered alternate years.

515-1 to 6 Seminar. Participation of staff and students in reporting and discussing research papers, research in progress, and current professional meetings. Required for all graduate majors in Food and Nutrition, one credit per quarter. Prerequisite: 420 or 421.

520-3 Advanced Nutrition. The biochemical and physiological basis of the metabolism of nutrients; current concepts. Prerequisite: 420 or equivalent. Offered alternate years.

556-4 Advanced Experimental Foods. Individual problems in food research and interpretation of pertinent literature. Prerequisite: 356, or 500, or equivalent. Offered alternate years.

572-2 to 8 Special Problems. For students recommended by their adviser and approved by the head of the department and the instructor in charge for independent work in directed study.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree. Registration with approval of instructor.

Foreign Languages

The following courses do not fall within the normal pattern of courses leading to advanced degrees:

288-9 (3,3,3) French as a Research Tool. Reading of French texts with emphasis on grammar as a tool for reading comprehension; development of reading skills in various fields; humanities, social studies, science; development of interpretative and translation skills in student's own discipline.

288-9 (3,3,3) German as a Research Tool. (a), (b) Emphasizes basic grammatical structure and building of vocabulary necessary to a reading knowledge. (c) Finalizes translation skills in the student's particular discipline. With consent of student's department satisfactory completion of 288c satisfies the Graduate School foreign language as a research tool requirement. Advanced placement in the courses determined by diagnostic tests.

288-9 (3,3,3) Russian as a Research Tool. (a), (b) Emphasizes basic grammatical structure and building of vocabulary necessary to a reading knowledge. (c) Finalizes translation skills in the student's particular discipline. With consent of student's department satisfactory completion of 288c satisfies the Graduate School foreign language as a research tool requirement. Advanced placement in the courses determined by diagnostic tests.

288-9 (3,3,3) Spanish as a Research Tool. (a), (b) Emphasizes basic grammatical structure and building of vocabulary necessary to a reading knowledge. (c) Finalizes translation skills in the student's particular discipline. With consent of student's department satisfactory completion of 288c satisfies the Graduate School foreign language as a research tool requirement. Advanced placement in the courses determined by diagnostic tests.

The purpose of these courses is to help graduate students prepare for proficiency examination as requested by the Graduate School for the Doctor of Philosophy degree. No prerequisite. Students must register for these courses and are advised to take them as part of, and not in addition to, their graduate program.

410-15 (5,5,5) Uncommon Languages (Intermediate Vietnamese). (See Linguistics 410 ghi.)

420-4 Modern Vietnamese Theater or Drama. Hat Boi (VN Opera), Hat Cheo (Popular Theater from North VN), Cai Luong (Modernized Opera and Musical), Thoai Kich (Modern Theater), and Kich Tho (Lyric Theater). Emphasis on the main plays, the stage techniques, and the literary and social meaning of those various forms of VN theater. Prerequisite: Linguistics 420 or consent of instructor.

430-3 Vietnamese Poetry. Classical and modern poetry. Emphasis on masterpieces and leading figures such as Ng Trae, Ng B Khiem, the authors of Chinh Phu Ngam and Cung Oan, Ng Huy Tu, Ng Du and the Kim Van Lieu, Ng Cong Tru, and the new poetry with the impact foreign poetry had on it. Prerequisite: Linguistics 420.

453-4 Methods in Teaching Modern Foreign Languages. Survey of general principles of second-language teaching, based upon insights of modern linguistics and learning-psychology. Intensive practical work in classroom and language laboratory with teachers experienced in the student's specific language field. Required of prospective teachers of modern foreign languages in the secondary schools. Prerequisite: concurrent or prior enrollment in a 300 level foreign language course.

477-3 Contemporary Vietnamese Prose. Open to advanced students. Short stories, novels, and essays (main trends and evolution). Emphasis on works of prominent authors since 1920, such as Nguyen V. Vinh, Pham Quynh, H. N.

Phach, Ng. Tr. Thuat, P. K. Binh, Khai Hung, and the recent generation. Prerequisite: Linguistics 410.

497-9 (3,3,3) Survey of Vietnamese Literature. Readings and analysis of selected works of Vietnamese literature from the beginning to the present time. Knowledge of Chinese characters and demotic characters not necessary, since all texts will be in Roman script. Presented in Vietnamese. Prerequisite: equivalent of two years of Vietnamese.

FRENCH

401-9 (3,3,3) French Literature of the 17th Century. (a) Tragedy: Corneille and Racine. (b) Comedy; Moliere, (c) Non-dramatic Literature. Prerequisite: 354, 397.

402-6 (3,3) Contemporary French Novel. (a) Major themes, forms, and techniques in the novel with particular emphasis on Gide, Proust, Malraux, Sartre, Camus, and Robbe-Grillet. (b) A study of the dramatic masterpieces of Girandoux, Claudel, Anouilh, Sartre, Camus, Ionesco, and Beckett with respect to structure, technique, themes, and language. May be taken out of sequence. Prerequisite: 354, 397.

403-9 (3,3,3) French Literature of the 18th Century. (a) Theater. (b) Novel. (c) Philosophic and Didactic Literature. Prerequisite: 354, 397.

408-4 French Civilization. Society, culture, social institutions, and the arts of contemporary France. Lectures, slides, discussions. Prerequisite: 350, or consent of instructor.

409-3 French Romanticism in the Drama, Novel, and Poetry. Prerequisite: 354, 397.

419-3 French Poetry from Nerval through Symbolism. Prerequisite: 354, 397.

429-6 (3,3) French Novel and Theatre, 1850-1930. (a) Realism, naturalism, and the reaction to these in the novel, from Flaubert through Barres. (b) Realism, naturalism, and symbolism in the theatre from mid-19th Century to 1930. Prerequisite: 354, 397.

430-2 to 6 Travel-Study in France. Comprises part of the travel-study program in France. Prerequisite: participation in the French travel-study program.

461-4 French Stylistics. A practical study of the aesthetics and theory of French literary expression through examination of various stylistics methods and through stylistic analyses of excerpts from representative works of great French authors. Prerequisite: 350, 354 or consent of instructor.

498-3 Honors Seminar. Study of an author or a special topic. Restricted to undergraduates. Prerequisite: consent of department.

499-4 Honors Essay. Individual exploration of some question, author, or theme of significance within the field of French literature or language. Restricted to undergraduates. Prerequisite: 498 and consent of department.

501-2 to 6 Seminar on a Selected French Author. Intensive study of one author. May be taken a maximum of 3 times.

509-2 to 6 Studies in 19th Century French Literature. Selected topics, movements, or authors.

515-6 (3,3) Old French. (a) Intensive reading and interpretation of the *Chanson de Roland*. (b) Reading of various Medieval works with linguistic analysis. Prerequisite: 410 or equivalent.

520-4 Graduate Composition. Composition based on study of contemporary French; translation, imitation, writing in various styles.

522-2 to 6 Studies in 20th Century French Literature. Selected topics, movements, or authors.

523-2 to 6 Studies in Medieval French Literature. Topics or authors in medieval French literature.

524-2 to 6 Studies in French Literature of the Renaissance. Topics or authors in French literature of the Renaissance.

526-2 to 6 Studies in 18th Century French Literature. Topics, movements, or authors in the literature of the 18th century.

527-3 French Bibliography. Bibliography and research methods in French and French culture. Chief reference works in the humanities and social sciences as they deal with France.

543-1 to 6 Research Problems. Individual research on a literary or linguistic problem involving original investigation in areas not covered by seminars or thesis.

536-2 Teaching French at the College Level. Prepares graduate students in

French for teaching at the university level. Required of all teaching assistants in French. May not be counted to satisfy secondary certification requirements.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

GERMAN

401-4 (2,2) Goethe's Faust. (a) The Faust legend and early Faust books and plays; the genesis of Goethe's *Faust*: reading of Part I. (b) Reading of Part II; study of the symbolism used such as the blending of paganism with Christianity, ancient Greek culture with Germanic culture. Must be taken in a,b sequence.

402-3 Advanced German Syntax. Descriptive and contrastive study of German syntax, with particular attention to the needs of prospective teachers.

403-3 German Ballads and Lyrics. A selective study of the foremost examples of German balladry and lyric poetry, ranging from the poetry of Klopstock and Buerger to that of Hesse, Benn, etc. Lectures, recitations.

404-4 Weimar and Its Aftermath. German writings from the inception of the Weimar Republic to the end of World War II, with special reference to the correlation existing between literary expression and social, economic, and political conditions.

406-3 The German Comedy. Comic and satirical works in German Literature, with special emphasis on the "Lustspiel" since 1800; lectures, reports.

407-2 Great German Plays of the 20th Century. Study and selective readings of outstanding stage successes; lectures, reports.

408-4 German Civilization. Intensive study of the German speaking areas of the world, with emphasis on the anthropological and sociological aspects of their respective cultures (Austrian, German, Swiss, "Reichs-deutsch," etc.); lectures, reports.

411-6 (3,3) Middle High German. (a) Grammar, and selective readings in both MHG originals and NHG translations of such epics as the *Nibelungenlied* and *Gudrun*. (b) The courtly epic poetry of such authors as Wolfram von Eschenbach, Gottfried von Strassburg, Hartmann von Aue, the lyric poetry of Walther von der Vogelweide, and didactic prose.

413-6 (3,3) German Linguistics. (a) Introduction to Comparative Germanic Linguistics tracing relationships among Germanic languages on the basis of phonology, morphology, and syntax. (b) History of the German language: a survey of the development of German through the Old-, Middle-, and New-High-German periods; lectures, readings, reports.

497-1 to 2 Readings in 18th Century German Literature. Departmental approval required.

498-1 to 2 Readings in 19th Century German Literature. Departmental approval required.

499-1 to 2 Readings in 20th Century German Literature. Departmental approval required.

500-2 Seminar in Contemporary Literature. Intensive study of the works of representative German authors, with special reference to the correlation existing between literary expression and social, economic, and political conditions since 1900. Lectures, outside readings, reports.

501-2 to 6 Seminar on a Selected German Author. Intensive study of one author—his life, his work, and his place in the literary and cultural development of civilization. Lectures, outside readings, reports.

506-2 Romanticism I. Study of the forerunners of German Romanticism: Holderlin, Jean Paul; and the authors of Early Romanticism: the writers of the so-called "Berlin School," with special attention to their involvement and reaction to 18th century thought. Lectures, reports.

507-2 Romanticism II. Study of Patriotic Romanticism: Kleist, Arndt, Korner, Uhland, etc. and Late Romanticism: Eichendorff, Lenau, Grillparzer, Heine, Morike, etc. Lectures, reports.

509-4 (2,2) Old High German. (a) Phonology, morphology, etymology, and syntax. (b) Continued study of grammar and reading of Franconian, Bavarian, and Alemannic texts.

512-3 19th Century German Novel. German literature from the decline of Romanticism to the end of the century. A study of trends and representative works of such authors as Keller, Fontane, Raabe, etc. Lectures, reports.

513-3 20th Century German Novel. Continuation of 512. Study of representative writers of expressionism, "Neue Sachlichkeit," etc. Lectures, reports.

514-3 Seminar in Folklore. Study of German folk literature, with emphasis on folk tales (such as Grimms' Household Tales, regional sagas, etc.), chapbooks (such as Dr. Faust, Till Eulenspiegel, etc.), folksongs (Des Knaben Wunderhorn), and folk drama. Lectures, reports.

533-3 Gothic. Historical setting and significance of Gothic; phonology, morphology and syntax; selected readings from Wulfila.

536-3 (1,1,1) Teaching German at the College Level. Prepares graduate students in German for teaching at the university level. Required of all teaching assistants in German. May not be counted to satisfy secondary certification requirements.

543-2 to 6 Research Problems. Individual research on a literary or linguistic problem involving original investigation in areas not covered by seminars or thesis.

599-2 to 9 Thesis.

RUSSIAN

400-4 Travel-Study in USSR. Specialized course comprising part of the travel-study program in the Union of Soviet Socialistic Republics. Prerequisite: 201c or equivalent.

405-4 Translation Techniques. Translation of material from social sciences, discussion of techniques, procedures, methodology, and the art of translation. Prerequisite: 330c or consent of department.

408-4 Soviet Civilization. A study of present-day political, economic, and social institutions of the Soviet Union. Reading and translation from contemporary news media. Prerequisite: 330c or consent of department.

411-8 (4,4) Introduction to Russian Classical Literature. Gogol, Pushkin, Turgenev, Tolstoy. Should be taken in a,b sequence.

412-4 Russian Realism. Authors in the 19th century Russian literature. Special attention to stylistic devices. Lectures, readings, and individual class reports. Prerequisite: 308c or consent of department.

413-4 Russian Drama in the Nineteenth Century. Griboyedov, Gogol, Pushkin, and minor dramatists. Prerequisite: 308c or consent of department.

414-3 Russian Poetry from Zhukovsky to 1920. A study of Russian Poetry from Sentimentalism through Symbolism. Prerequisite: 308c or consent of department.

415-3 Russian Phonetics. Analysis of the sounds of Russian and their manner of production; intonation and stress; levels of speech, oral practice. Prerequisite: 201c.

416-4 Russian Poetry Since 1920. Literary trends and representative works of Russian poets such as Mayakovsky, Yevtushenko, Voznesensky, and others. Prerequisite: 308c or consent of department.

425-3 Soviet Russian Literature. Major fiction writers and literary trends since 1917. Lectures, readings, and reports. Prerequisite: 308c or consent of department.

452-4 Advanced Composition and Conversation. Oral and written composition of a practical nature for advanced students; emphasis on study of idiomatic expressions and current usage.

462-4 Russian Stylistics. Writing style in Russian and its application to the development of skill in written expression. Advanced work in the principles of Russian grammar and composition. Prerequisite: 308c or consent of department.

500-2 Seminar in Contemporary Russian Literature. Intensive study of the works of representative Russian authors, with special reference to the correlation existing between literary expression and social, economic, and political conditions since the Revolution. Lectures, outside readings, reports are required.

501-2 Seminar on a Selected Russian Author. Intensive study of one author, his life, his work, and his place in the literary and cultural development of civilization.

503-2 Seminar on 19th Century Russian Literature. Intensive study of the modern Russian novel as an expression of social and cultural movements. Outside readings and class discussions.

510-3 Russian Literature of the 18th Century. The Baroque period, classicism and sentimentalism. Emphasis on the classical period of the 18th century. Analysis of texts and reports.

514-6 (2,2,2) History of the Russian Language. A survey of the phonological, morphological, and syntactical changes from the period of the common Slavic to the present Russian literary language.

520-8 (4,4) Russian Linguistics. (a) Introduction to contemporary comparative Slavic linguistics tracing relationships among Slavic languages on the basis of phonology, morphology and syntax. (b) Analysis of present-day Russian with special attention to syntax. Lectures, readings, reports. Prerequisite: 400 level courses.

543-1 to 6 Research Problems. Individual research on a literary or linguistic problem involving original investigation in areas not covered by seminars or thesis.

599-2 to 9 Thesis.

SPANISH (Iberian)

400-4 Travel-Study in Spain. Course taught as part of the travel-study tour in Spain. Usually given in the summer. Prerequisite: participation in travel-study tour in Spain.

401-3 Spanish Novel of the 19th Century. Study of representative novels of Fernan Caballero, Valera, Pereda, Galdos, etc.

402-3 Spanish Drama of the 18th and 19th Centuries. Reading of representative plays of the chief dramatists from Moratin to the Generation of 1898.

403-3 Spanish Poetry. General survey of Spanish poetry from its beginnings to 1900.

404-6 (3,3) Spanish Literature of the Twentieth Century. (a) The Generation of 1898. (b) Contemporary Novel and Essay. Main trends of the Spanish novel and essay since 1900.

415-4 The Linguistic Structure of Spanish. Phonology and grammatical structure of Spanish. Examination of the features of the principal dialects. Required of all majors.

425-4 History of the Spanish Language. Survey of development from the Middle Ages to the present.

440-6 (3,3) The Golden Age: Drama. Plays of Lope de Vega, Calderon, Tirso de Molina, Ruiz de Alarcon, and others.

445-4 Cervantes. Don Quixote; Other works assigned as collateral readings.

475-3 to 12 General Topics in Spanish. Selected topics in literature or linguistics of special interest, for major concentrations in Spanish.

490-1 to 6 Readings in Spanish. Directed independent readings in a selected area. Prerequisite: consent of department.

501-2 to 6 (2 per quarter) Seminar on a Selected Spanish Author. Study of one author—his life, his works, and his relationships to the literary and social currents of his time.

505-3 The Picaresque Novel. Study of the *Lazarillo*, with collateral readings of other masterpieces of this genre.

506-3 The Renaissance. Literature of the Renaissance in Spain, including the drama, the novel, the lyric poetry, and the histories of the Indies.

515-6 (3,3) Old Spanish. (a) Intensive reading and interpretation of the *Poema de Mio Cid*. (b) Reading of various medieval works with linguistic analysis. Prerequisite: 410 or equivalent.

520-3 Seminar in Syntax. Stylistics and grammatical analysis.

525-3 The Spanish Ballads. The romance studied as a part of the literature and folklore of Spain and the New World.

536-3 (1,1,1) Teaching Spanish at the College Level. Prepares graduate students in Spanish for teaching at the university level. Required of all teaching assistants in Spanish. Does not satisfy secondary certification requirements.

543-1 to 6 Research Problems. Individual research on a literary or linguistic problem involving original investigation in areas not covered by seminars or thesis.

560-4 Spanish and Latin American Bibliography. Bibliography and research methods in Spanish and Spanish American culture. Introduction to the use of the chief reference works in the humanities and social sciences as they deal with Spain and Spanish America.

575-3 to 12 Advanced Topics in Spanish. Selected topics in literature or linguistics of special interest for major concentrations in Spanish.

599-2 to 9 Thesis. Minimum of five hours to be counted toward a master's degree.

SPANISH (American)

- 400-4 Travel-Study in Spain.** Course taught as part of the travel-study tour in Spain. Usually given in the summer. Prerequisite: participation in travel-study tour in Spain.
- 421-3 Survey of Modernism in Spanish American Poetry.** Study of its origins, characteristics and achievements.
- 422-3 Contemporary Spanish American Poetry.** Spanish American poetry since modernism.
- 423-4 The Mexican Novel of the 20th Century.** Emphasis on fiction dealing with the Revolution and related social problems.
- 424-4 Gaucho Literature.** Study of the Gaucho as a social class and of the types of literature developed to portray and symbolize his way of life, attitudes, and values.
- 426-3 The Mexican Short Story.** Survey of the Mexican short story from pre-Conquest to the present.
- 427-3 Spanish American Drama.** Study of representative works of Florencio Sanchez, Rodolfo Usigli, Armando Mooock, Samuel Eichelbaum, Xavier Villarrutia, and others.
- 475-3 to 12 General Topics in Spanish.** (See Spanish—Iberian).
- 478-4 Seminar in Latin American Thought.** (See Philosophy 478.)
- 500-2 to 6 (2 per quarter) Seminar in Latin American Fiction.** The works of a specific novelist or group of novels on a similar theme studied as a reflection of social and cultural conditions in a country or geographical area.
- 535-3 Mexican Essayists of the 19th Century.** Currents of Mexican thought in the 19th century.
- 536-3 (1,1,1) Teaching Spanish at the College Level.** Prepares graduate students in Spanish for teaching at the university level. Required of all teaching assistants in Spanish. Does not satisfy secondary certification requirements.
- 538-3 Seminar on Spanish American Poetry.** Study of the works of a single poet, of a group of poets, or of literary trends or movements.
- 541-3 Seminar on Spanish American Literary Criticism.** Significant documents of literary criticism from Independence to the present.
- 543-2 to 6 Research Problems.** (See Spanish—Iberian.)
- 560-4 Spanish and Latin American Bibliography.** (See Spanish—Iberian.)
- 575-3 to 12 Advanced Topics in Spanish.** (See Spanish—Iberian).
- 599-2 to 9 Thesis.**

ROMANCE PHILOLOGY

- 410-4 Romance Philology I.** Survey of phonology, morphology, and syntax changes in Romance languages in general; special attention to the developments in French and Spanish for majors in these fields.
- 514-4 Romance Philology II.** Studies in syntax of Old French and Old Spanish. Prerequisite: 410 or equivalent.
- 516-4 Arthurian Romance.** Readings in the Arthurian Romances of the student's major interest (French or Spanish) with reference to the genre as a whole. Prerequisite: 410 or equivalent.

Forestry

- 401-3 Advanced Forest Mensuration.** Theory and practical problems in biometrics to obtain estimates of forest populations. Use of computers and other advanced techniques. Prerequisite: 363a,b or equivalent.
- 410-3 Forest Management for Wildlife.** Interrelations between forest practices and game. Forest protection from mammals and birds. Emphasis is on treatment of the forest. Prerequisite: Zoology 463, forestry major, or consent of instructor.
- 420-4 Advanced Wood Technology.** The study of wood as an industrial and structural material; the botanical, physical, chemical, and mechanical properties are discussed. The advantages and disadvantages of wood as a raw material are analyzed. Prerequisite: 320, Mathematics 111a,b or equivalent.
- 427-3 Mineral Nutrition of Plants.**
- 433-4 Forest Products Industries.** Raw material requirements, the processes and the products of forest industries. The past, present, and future economic

status of each industry is briefly examined. Prerequisite: 320 or consent of instructor.

440a-4 Ecology of Grasses and Grasslands. (Same as Botany 440a.) Structure, analysis and dynamics of grassland communities; structure and growth of individual species. Prerequisite: Biology 307 or consent of instructor.

450-4 Forest Park Management. Fundamentals in the management and administration of parks and recreation areas, at the metropolitan state and federal level. Includes purpose, objectives, criteria for selection, policy, management practices, and problems in providing outdoor recreation in a natural environment.

451-7 (3,4) Forest Park Plans. Fundamental and applied principles and elements involved in site, master, and comprehensive planning for outdoor recreation at the state, metropolitan, and federal level. Prerequisites: taken in a,b sequence or consent of instructor.

460-3 Forest Park Field Studies. Park conditions, visitors, and management practices in different county, state, and federal park systems in the United States. Extended field trip. Cost shared by students. Prerequisite: 350a.

465-2 Forest Field Studies. Extended trip to study forest conditions and management practices in forest regions of the U. S. Cost shared by students. Taught spring camp only. Prerequisites: 330, 363a, 365a.

466-3 Forest Watershed Management. Effects of treatment of forested watersheds on quality and quantity of water yield. Consideration of alternative in water use and flood control. Prerequisites: 365a, Plant Industries 301, GSA 330, or consent of instructor.

470-8. (4,4) Economics of Forestry. (a) Introduction to forest economics; forestry production and investment. Prerequisite: GSB 211a. (b) Forestry marketing, macro-economics and planning. Taken in a,b sequence. Prerequisite: Agricultural Industries 204, or Economics 215, or equivalent.

471-4 Land Resource Economics. (Same as Agricultural Industries 471 and Economics 471.) The use of land as an economic variable in production of goods and services; land markets; group versus individual conflicts; elementary land resources planning techniques. Prerequisite: 470a or Economics 440 or Agricultural Industries 350.

475-4 Forest Management. The application of business procedures and technical forestry principles to manage forest properties for their resources and benefits. Prerequisite: 363, 365.

483-4 Urban Forest Management. Evaluation of urban forests, city forest preserves, and city watersheds. Emphasis on urban environment (soil, water, atmosphere) and tree species adapted to it. Administrative and legislative problems and forestry practices considered. Expenses required for 3-day field trips. Prerequisite: 221 or knowledge of plant materials.

490-4 to 16 Practicum. Supervised practicum experience in a professional setting. Emphasis on administration, supervision, teaching, and program leadership in community, school, park and forest, institution, and other recreation settings. Prerequisite: consent of instructor.

520a-1 to 6 Readings in Forestry or Forest Recreation. Intensive consideration is given to current practices and problems in forestry. Prerequisite: consent of instructor.

520b-1 to 6 Readings in Resource Economics. (Same as Economics 502 or Agricultural Industries 520b.) Directed readings in the field of resource economics. Prerequisites: consent of instructor.

520c-1 to 6 Readings in Forest Products or Wood Service. Advanced study of the techniques of manufacture in the wood and fiber using industries. Also, advanced study of physical, mechanical and chemical properties of wood as a material. Prerequisite: consent of instructor.

570-4 Principles of Research. Research philosophy, approaches to research; theory, hypotheses, inference and prediction; problem identification, project development and organization; methods of data collection, analysis and presentation; drawing conclusions and organizing results. Prerequisite: 4 hours in statistical methods or consent of instructor.

575-1 to 6 Research. Directed research in selected fields of forestry.

581-1 to 6 Advanced Forestry Seminar. Study and discussion of contemporary forestry problems. Prerequisite: consent of instructor.

588-1 to 12 International Graduate Studies. University residential graduate study program abroad. Prior approval by the department is required both for the nature of program and the number of quarter hours of credit.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Geography

404-7 (4,3) Advanced Economic Geography I. Deals with one or more of the following: transportation, manufacturing, agriculture, resources, trade and urban geography; depending on, and varying with, interests of instructors. Thus, a student may register more than one time. Emphasis will be directed at familiarizing the student with techniques of analysis, and at developing concepts and principles that underlie understanding of the phenomena and their geographic significance. Prerequisite: 304.

406-7 (4,3) Advanced Cultural Geography I. Deals with one or more of the following: population, settlement, ethnic characteristics, political factors; depending on, and varying with, interests of the instructors. Thus, a student may register more than one time. Emphasis will be directed at familiarizing the student with techniques of analysis, and at developing concepts and principles that underlie understanding of the phenomena and their geographic significance. Prerequisite: 306.

407-7 (4,3) Advanced Cultural Geography II. Content drawn from same broad range of topics as 406. To be alternated with 406 to enable student to specialize further in cultural geography. Prerequisite: 306 or consent of instructor.

410-8 (4,4) Advanced Geographic Techniques. Geographic applications of cartographic and quantitative research techniques. Prerequisite: 310 or consent of instructor.

416-8 (4,4) Cartography. Instruction and practice in the techniques of map-making and problems in map reproduction. Laboratory. Prerequisite: 310.

421-4 Urban Geography. Examination of extracity relationships-theory and structure, intra-city relationships-theory and structure, and selected urban problems. Offered once annually. Prerequisite: consent of department.

422-8 (4,4) Economics in Geography. (a) Concepts, symbols, theory, language. Theory and analysis. Elementary mathematics, individual's preferences, production functions, the firm, markets, welfare economics, Pareto Optimality, and externalities. (b) Process, criteria, conditions. Certainty, uncertainty, and inter-temporal criteria; public, private, and merit goods and services; multipliers; shadow prices, spatial and regional economic concepts; public expenditure criteria; free market allocation, comprehensive plans, and multiple objectives. Prerequisite: taken in a,b sequence or consent of instructor.

424-2 to 12 Regional Problems in Conservation.

425-8 (4,4) Economics in Geography. (See Economics 425).

430-4 Theory of Environment. Exploration of the hypothesis that the physical environment works on local hydrology, soils, natural vegetation, agriculture, and landforms, through energy and moisture exchanges. Emphasis on model building for comparison of subsystems, to rate effectiveness of contrasting environments, and to project these consequences to environmental management questions. Prerequisite: consent of department.

432-12 (4,4,4) Exchanges in Environment. (a) Energy exchanges in the environment. (b) Moisture exchanges in the environment. (c) Momentum exchanges in the environment. Prerequisite: 302, or 400, or consent of the department.

433-8 (4,4) Advanced Physical Geography. Topics may include landforms, climate, soil, or water. Varies with the interests of the instructor. Prerequisite: 302.

438-4 Applied Meteorology. (See Geology 438.)

440-2 to 6 Reading for Majors. Supervised readings in selected subjects. Prerequisite: advanced standing.

443-4 Teaching of Geography. Presentation and evaluation of methods of teaching geography. Emphasis upon geographic literature, illustrative materials, and teaching devices suitable to particular age levels. Prerequisite: 300.

450-4 Physical Environmental Systems in Geography. Research in physical geography. Budgeting of energy, momentum, and matter to models of atmospheric diffusion and circulation. Emphasis on research problems in urban climatology, hydrometeorology, bioclimatology, medical geography, and climatic geomorphology.

451-4 Resource Management Systems in Geography. Literature in resource management problems. Emphasis on theory methods of measurement and evaluation concerning implications of public policy. The role of resources in

economic development and regional planning, water and related land resource problems, and environmental quality from a multi-disciplinary perspective.

452-4 Systems of Cultural Adaptation in Geography. Cultural-historical inquiry in geography. Emphasis on theory and methodology in the study of the relations between nature and culture, the evolution of livelihood forms, and cultural persistence and change in a geographical context.

470-16 (4,4,4-8) Urban Planning. (Same as Government 470.) (a) Planning concepts and methods, (b) field problems, (c) planning and public administration internship. Prerequisite: junior standing.

471-8 (4,4) Regional Planning. Examination of the viewpoint, methods, and techniques of regional planning. Prerequisite: consent of instructor.

487 (2,4,4) Honors in Geography. (a) Tutorial, (b) reading, (c) supervised research. Must be spread over the last two years of the undergraduate's career. Open to students in the honors program with consent of the department. May be taken in either a,b,c or b,a,c sequence.

490-1 to 16 Tutorial in Geography. Individual and small group conferences with staff members to examine geographic concepts. Prerequisite: Institute status.

500-4 Geographic Techniques I. Emphasizes field and quantitative techniques used in geography.

502-4 Principles of Research. Meaning, philosophy, science, reasoning, creative endeavour, problem identification of research, research methodology, preparation of project statements, analysis, and results in a multi-disciplinary approach. Prerequisite: graduate standing.

505-8 (2,2,2,2) Pro-Seminar in Geography. Discussion of basic issues and development of professional perspective in (a) Physical, (b) Economic, (c) Cultural, (d) Geographic Thought. Taught by the entire resident staff.

511-4 Philosophy of Geography. The nature of geography. Current trends in the field, present-day geographers, and schools of thought. Geography's place among the disciplines.

514-2 Teaching of College Geography.

515-4 to 6 Field Course. Designed to give actual experience in the field. Under guidance of staff members students will gather data and work toward the solution of selected field problems in one particular region of the world. This course will not be offered on campus, but will be in a field camp location suited to the study of selected problems. Prerequisite: consent of department.

520-2 to 12 Seminar in Physical Geography.

521-2 to 12 Seminar in Economic Geography.

522-2 to 12 Seminar in Regional Geography.

523-4 to 12 Seminar in Cartography.

524-2 to 12 Seminar in Cultural Geography.

525-4 Seminar: Economics in Geography. (See Economics 525.)

527-2 to 8 Seminar in Urban and Regional Planning. Prerequisite: graduate standing or consent of instructor.

530-2 to 10 Independent Studies in Geography.

540a-2 to 36 Research in Physical Geography.

540b-2 to 36 Research in Economic Geography.

540c-2 to 36 Research in Regional Geography.

540d-2 to 36 Research in Cultural Geography.

550-2 Introduction to Graduate Studies in Geography. Faculty introduce examples of research and convey the nature of researchable topics to students. Introduces students to the evaluation of research designs. Prerequisite: graduate standing.

599-9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor or Philosophy degree.

Geology

400-3 Earth Science Seminar. Two classroom meetings per week and two field trips on the observational, interpretive, and communicative aspects of earth science subjects. Prerequisite: all earth science minor courses.

410-4 Stratigraphy and Sedimentation. The characteristic features of sedimentary rocks and their processes of origin; the classification of stratigraphic units, methods of correlation, and paleogeologic reconstruction. Laboratory. Prerequisites: 220, 221, 310a,b, 315, and 425a,b or consent of instructor.

411-3 Mineralogy III. Elementary crystallography. Applications of physical principles to mineralogical problems.

414-5 Paleobotany. (See Botany 414.)

415-3 Optical Mineralogy. The optical properties of minerals and the use of the petrographic microscope for identification of crystals by the immersion method and by thin section. Laboratory. Prerequisites: 310, Physics 208.

416-4 X-Ray Crystallography. Introduction to the study, measurement, and identification of unknown crystalline materials by X-ray diffraction techniques (especially the Debye-Scherrer methods). Upon request, non-geology majors may work with unknowns from their own fields of study. Prerequisites: 310, Mathematics 150.

420-8 (4,4) Geology of Petroleum. The geological occurrence of petroleum, including origin, migration, and accumulation; a survey of exploration methods and production problems and techniques. Laboratory study applies geological knowledge to the search for and production of petroleum. Laboratory. Prerequisites: 221, 302.

425-8 (4,4) Invertebrate Paleontology. (a) Principles of paleontology and a survey of important invertebrate phyla and their fossil representatives. (b) Paleoecology. Laboratory. Field trips required. Must be taken in a,b sequence. Prerequisite: 221 or GSA 201.

430-4 Physiographic Provinces of North America. Gives the student an intelligent appreciation of the evolution of land forms in the physiographic provinces of North America and explains the surface features in a landscape. Prerequisite: 220.

435-8 (4,4) Hydrogeology. Introduces the geological factors in the origin, distribution, movement, and chemistry of natural water of the earth. Prerequisites: 220 or Mathematics 150.

436-8 (4,4) Elementary Exploration Geophysics. Lectures on theory and interpretation of geophysical exploration methods. Laboratory to involve use of instrumentation and interpretation of field data. Field trips required. Prerequisite: 220, Physics 211 or concurrent enrollment.

438-Applied Meteorology. (Same as Geography 438.)

Analysis of meteorological patterns approached through study of several case histories. Evaluation of meteorological data, air mass and frontal analysis, development of weather forecasts, study of meteorological instruments, clouds, and precipitation patterns. Prerequisite: GSA 330 or consent of instructor.

445-3 (1,1,1) Seminar in Geology. Study of major problems in Geology. Primarily student discussion based on library work. Prerequisite: senior standing.

450-12 (3,9) Field Geology. (a) Introduction to field techniques, principles of geologic mapping, and map interpretation. (b) Advanced field mapping including problems in stratigraphy, structure, paleontology, geomorphology, and economic geology. Written geologic report. Prerequisite: 302 and 315.

455-3 Engineering Geology. (See Engineering 455.)

460-4 Geological Data Processing. Two lecture and two laboratory periods each week for instruction in computer application to geological problems including the processing and programming of data and the interpretation and evaluation of results. Prerequisites: Engineering 222 or Mathematics 225.

470-9 (3,3,3) Earth Science for Teachers. Study of the earth's dynamic system, applying the principles of the physical and earth sciences to man's environmental problems. Prerequisite: teaching experience.

482-4 Coal Petrology. Structural features and microscopy of coal seams. Origin and alteration of coal constituents. Includes field trips, study of coal specimens, and techniques. Prerequisite: 220 and 221 or consent of instructor.

484-4 Palynology. (Same as Botany 484.) Taxonomy, morphology, stratigraphic distribution, and ecology of fossil pollen, spores, and associated microfossils. Prerequisite: 220, 221, or consent of instructor.

510-8 (4,4) Sedimentation-Stratigraphy. (a) Advanced sedimentation. Properties and classification of detrital and carbonate sediments. Sedimentary processes. Methods and criteria for interpretation of environments of deposition. (b) Stratigraphic column, stratigraphic maps, correlation, radiometric chronology, basin analysis, and stratigraphic models. Prerequisite: 410.

513-3 Advanced Geologic Data Analysis. Probabilistic and statistical methods utilized in the analysis of geologic data. Emphasis on sedimentary and stratigraphic data analysis. 2 hours of lecture and one laboratory period each week. Prerequisite: 460 or consent of instructor.

515-12 (4,4,4) Mineral Deposits. (principles, metallics, nonmetallics) Principles of mineral deposition and genesis, and the origins and geologic settings

of the important mineral deposits of the world. Laboratory. Prerequisites: 302, 310.

520-12 (4,4,4) Advanced Petrology. (a) Igneous Petrology. Physical chemistry, petrographic classification, and genetic relationships of the igneous rocks. (b) Metamorphic Petrology. Physical chemistry, petrographic classification, and genetic relationships of the metamorphic rocks. (c) Sedimentary Petrology. Petrographic classification and origin of sedimentary rocks. Prerequisites: 310, 415, or equivalent.

528-6 (3,3) Micropaleontology. Structure, classification, paleoecology, stratigraphic distribution, and evolution of microfossils. Laboratory work in techniques of collection, preparation, and study of microfossils. Identification and use of microfossils in solving stratigraphic problems. Preparation for research in micropaleontology. (a) Conodonts and ostracodes. (b) Foraminifera. Prerequisite: 425 or consent of instructor.

529-8 (4,4) Advanced Invertebrate Paleontology. Research in paleontology and the use of macrofossils in solving stratigraphic problems: (a) Bryozoans, mollusks, and arthropods. (b) Coelenterates, brachiopods, and echinoderms. Prerequisite: 425 or consent of instructor.

540-1 to 9 Advanced Studies.

541-1 to 9 Research.

582-3 Advanced Coal Petrology. Microscopy, source materials, coalification, constitution and classification of peats, lignites, bituminous coal, anthracite, applications to industrial problems. Prerequisite: 482.

584-3 Advanced Palynology. (Same as Botany 584.) Paleoecological interpretations, morphology and advanced techniques of analysis and preparation of fossil spores and pollen. Prerequisite: 484.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Government

403-4 Introduction to the Theories of International Relations. Systematic analysis of a variety of approaches which seek to explain the actions of nations. The realist and utopian traditions, ecological factors, decision-making processes, theories of conflict and integration, equilibrium and systems analysis, and other topics. Prerequisite: GSB 303 or graduate standing.

406-4 The American Chief Executive: President and Governor. A study of the origin and background of the presidency and the governorship, qualifications, nomination and election, succession and removal, the organization of the executive branch, and the powers and functions of the president and governor. Prerequisite: GSB 211b or 231.

411-4 Senior Seminar in Political Behavior. Examines in depth such topics as political participation and influence (mass and elite), political conflict, political socialization and recruitment, political leadership. Prerequisite: 200 recommended.

420-4 Pressure Groups and Politics. An analysis of interest groups and their techniques of political propaganda. Prerequisite: 231 or GSB 211b.

425-4 Blacks and Whites in American Politics. Topics include various forms of political participation, leadership behavior, and analysis of political strategies including the Black Power concept. Prerequisite: 231 or GSB 211b.

430-3 Government and National Security. The role of the military in American society and policies and the development of military and disarmament policy. Comparison made between American developments and in other countries, including Russia.

436-3 Government and Labor. (See Economics 436.) Prerequisite: 231, or GSB 211a,b, or consent of instructor.

438-4 Social Welfare Legislation. The Social Security Act and other legislation of major significance for the welfare and maintenance of the family, the handicapped, children, and other special groups. Their relationship of the legal structure of federal, state, county, township, and municipal welfare facilities and institutions with indications of economic and social consequences.

440-4 Public Personnel Administration. An analysis of some of the central problems encountered by the government executive in recruiting, maintaining, and developing personnel, such as political neutrality, leadership and motivation, career development, security regulations, and the role of personnel in policy planning and execution. Prerequisite: 360.

441-4 Philosophy of Politics. (See Philosophy 441.)

450-12 (4,4,4) Latin American Governments. (a) Problem analysis of contemporary Latin American government and politics. (b) Latin American national systems. (c) Hemispheric relations. No prerequisite but GSB 392 recommended.

451-4 International Politics of Europe. Comparative analysis of foreign policies of major states. Includes nationalism, unification and security, and Western Europe's relations with the developing world, Eastern Europe, the U.S.S.R., and the U.S.A.

452-4 Government and Politics of Sub-Saharan Africa. Government and politics of French-, English-, and Portuguese-speaking areas of sub-Saharan Africa. Reference to decolonization process and the relations of African states with each other and with non-African powers. May be taken in any sequence. Prerequisite: GSB 390, or 391, or consent of instructor.

453-12 (4,4,4) Soviet Russia. (a) Ideological foundations of Soviet politics. (b) Dynamics of Soviet government and economy. (c) Soviet foreign relations. Prerequisite: GSB 390 or consent of instructor.

454-8 Development of German Democracy. Involves a summer's residence in Germany with classroom material supplemented by lectures by German professors and government officials. Prerequisite: consent of instructor.

455-4 Major Governments of Western and Central Europe. A comparative study of the political systems of the major countries of Western and central Europe. Prerequisite: GSB 390 or consent of instructor.

456-4 Great Britain and the Commonwealth. The commonwealth association and the politics of Great Britain and the "Old Commonwealth" countries: Australia, Canada, New Zealand.

457-8 (4,4) Government and Politics in the Near and Middle East. (a) The Arab states of the Middle East and Israel. Socialization and integration patterns, the traditional and revolutionary regimes, and regional cooperation and conflict. (b) Historical background of the emergence of Turkey, Iran, Afghanistan, and their present governments and politics. May be taken in any sequence. Prerequisite: GSB 390 or consent of instructor.

458-12 (4,4,4) Government and Politics of Asia. (a) Politics and governments of Burma, Thailand, Malaysia, North Vietnam, South Vietnam, Cambodia, Laos, Singapore, Indonesia, and the Philippines. (b) Internal political, economic, and social development of China (Taiwan), Japan, and Korea in modern times. (c) Politics in India, Pakistan, Ceylon, Nepal. May be taken in any sequence.

459-4 Politics of Developing Areas. A survey, theoretical and descriptive, of the impact upon politics of the process of development, and the role of the governmental system in the direction and control of development. Prerequisite: GSB 390 or consent of instructor.

461-4 Organization Theory and Public Administration. Analysis of various theoretical approaches to public administration with emphasis on recent American literature in this field. Prerequisite: 360 or consent of instructor.

462-3 Intergovernmental Relations. Interaction between governmental units in the American federal system and the impact on the formulation of public policy and the performance of governmental functions. Prerequisite: 231 or GSB 211b.

463-3 Government Social and Economic Policy. Examination of public policy-determining agencies and attributes of the American governmental system, with especial emphasis upon the national government and its processes and arrangements for social and economic policy-formulation and implementation. Prerequisite: GSB 211b.

466-3 State Government and Administration. Emphasis on recent developments and research findings. Prerequisite: 232.

467-4 Urban Politics. Environment, institutions, processes, and functions of government in an urban society. Emphasis on current problems of social control and the provision of services in the cities. Prerequisite: 232.

469-3 Administration of State and Local Finance. An examination of the administrative problems connected with local and state revenues and expenditures in the U.S. Prerequisite: 232.

470-4 Urban Planning. (See Geography 470.)

471-4 The Organization and Administration of American Foreign Policy. An advanced course dealing with the organizational and administrative aspects of American foreign policy. Prerequisite: GSB 345 or consent of instructor.

472-4 International Organization. Development and organization of international governmental and administrative systems, with emphasis on the United Nations. Prerequisite: GSB 303.

474-3 Law Enforcement Administration. (Same as Administration of Justice 474.) Development and changing roles of the police; forms of state, local, and municipal control; conflict areas, intergovernmental cooperation, and developing needs for regional law enforcement; structures and internal administration of police departments; the police, organized crime, riots, and minorities. Prerequisite: 360, 467, or consent of instructor.

475-8 (4,4) International Law. (a) Rules and practices governing the nations in their relations in peace and war. (b) Investigation of special problems in international law. Prerequisite: GSB 303 and 475a or consent of instructor.

477-4 Governments and Politics of Vietnam: North and South. Development of nationalist and communist political groupings since the period of French domination. Role of the religious sects and the private armies. Constitutions and the legal and political systems of the two Vietnams.

478-4 International Politics. Alignment and conflicts of the major powers in historical and contemporary perspective. Emphasis on the basic interests of the great powers, regional arrangements, spheres of influence, the use of coercion in world politics. Prerequisite: basic courses, related training, or consent of instructor.

480-4 The Pacific and the Far East. Political and strategic problems and the interplay of the foreign policies of the major powers in this area. Prerequisite: GSB 303 or History 370.

484-8 (4,4) History of Western Political Theories. (Same as Philosophy 484) (a) Outstanding political theories of the ancient and medieval periods, including theories of Plato, Aristotle, Cicero, St. Augustine, and Thomas Aquinas. (b) Important political theories from the Renaissance to the end of the 18th Century, including the theories of Machiavelli, Hobbes, Rousseau, Locke, and Burke.

485-4 Political Psychology. Psychological theories as related to the development and change of political attitudes, leadership behavior, and mass political participation. Prerequisite: 200 recommended.

487-6 (3,3) American Political Ideas. (a) Political ideas which shaped American beliefs and U.S. governmental systems, from pre-Colonial beginnings through the mid-Nineteenth Century. (b) Continuation of (a). From the mid-Nineteenth Century to the mid-Twentieth. Prerequisite: 231 or GSB 211b.

488-9 (3,3,3) Recent Political Theory. (a) Outstanding liberal political theorists from John Stuart Mill to the present. (b) Outstanding revolutionary political theorists from Karl Marx to the present. (c) Outstanding idealistic and nationalistic political theorists from Hegel to the present. May be taken in any sequence. Prerequisite: senior or graduate standing, or consent of instructor.

490-2 to 6 Honors Research. Not for graduate students. Prerequisite: consent of instructor and chairman.

495-12 (4,4,4) American Constitutional Law and the Judicial Process. (a) Role and policy of courts and the U.S. Supreme Court in the American political system. The court system, judicial review and self restraint, intergovernmental relations, separation of powers of the three branches, and the expansion of national power. Foreign commerce, war powers, power of taxation, and spending power. (b) Civil liberties and civil rights. Rights of property under the contract and due process clauses and the rights of the first amendment. Prerequisite: 495a highly recommended. (c) Constitutional guarantees relating to criminal procedure, equal protection clause, i.e., the constitutional guarantee against racial and other invidious discrimination, citizenship and elections, and the expansion of congressional power to legislate in the area of civil rights. All 3 sections need not be taken, however, if they are they must be in sequence. Prerequisite: GSB 211b or equivalent.

497-4 Administrative Law. Law as it affects public officials in carrying out the rights, duties, and necessary functions of the public office. Prerequisite: 360.

498-4 Jurisprudence. (Theories of Law.) Major schools in legal thinking. Positive law and natural law. Idea of justice and concept of natural rights.

500-9 (3,3,3) Methods of Empirical Research. (a) Problems in the philosophy of science as related to research in political science. (b) Discussion of alternate

data acquisition techniques and research designs for social scientists. (c) Techniques of data analysis and computer applications in social science research. Sections a and b are required.

501-4 to 12 Seminar in Legislative Process. Prerequisite: basic courses, related training, or consent of instructor.

502-4 to 12 Seminar in Selected Governmental and Political Problems. Prerequisite: basic courses, related training, or consent of instructor.

503-4 to 12 Seminar in Pressure Groups. Prerequisite: 420 or consent of instructor.

504-4 Seminar in Judicial Process. An examination of the literature on such topics as judicial selection, the impact of court decisions, court procedure, and the factors affecting the decision-making behavior of judges. Prerequisite: 495 or equivalent or consent of instructor.

505-4 to 12 Seminar in Political Parties. Prerequisite: basic courses, related training, or consent of instructor.

506-4 to 12 Seminar in Political Behavior. Prerequisite: basic courses, related training, or consent of instructor.

508-4 to 12 Seminar in International Politics. Prerequisite: basic courses, related training, or consent of instructor.

509-4 to 12 Seminar in International Organization. Prerequisite: 472 or consent of instructor.

510-4 to 12 Seminar in State Government and Politics. Prerequisite: 466 or consent of instructor.

511-4 to 12 Seminar in Local Government and Politics. Prerequisite: 467 or consent of instructor.

512-4 to 12 Seminar in Public Administration. (a) Devoted to comparative public administration. (b) In depth study of selected problems of public administration. Prerequisite: 461 or consent of instructor.

513-4 to 12 Seminar in Constitutional Law. Prerequisite: 495 or consent of instructor.

515-4 to 12 Seminar in Comparative Government and Politics. Prerequisite: basic courses, related training, or consent of instructor.

516-4 to 12 Seminar in Municipal Administration. Prerequisite: 467 or consent of instructor.

517-4 to 12 Seminar in Political Theory. Prerequisite: 484, 488, or consent of instructor.

520-4 to 12 Seminar in American Foreign Policy. Prerequisite: basic courses, related training, or consent of instructor.

521-1 to 12 Readings. Supervised readings in selected subjects. Not more than 6 hours may apply toward the master's degree. Prerequisite: consent of instructor.

525-4 to 12 Seminar in International Law. Prerequisite: 475a or consent of instructor.

530-4 to 12 Internship in Public Affairs. Field work in the office of a governmental agency; city, county, state, national, or international. Under certain circumstances it might be in the office of a political party organization or in that of some organized pressure group. The type of internship and the place and organization in which it is taken must be mutually satisfactory to the student and the department. A paper in which the student correlates his academic knowledge with his practical experience is required. Prerequisite: consent of department.

531-4 to 12 Seminar in Empirical Theory. Systems structural-functional, conflict, decision-making, integration, organization, exchange, communications, democratic, totalitarian, change, and revolution theories analyzed to determine domain and predictive and explanatory capacities. Half of these theories offered every other year. Prerequisite: 500a,b or consent of instructor.

551-4 Polimetrics. Advanced seminar in empirical political science. Topics explored in depth: simulation, graph theory, game theory, applied non-parametric statistics, multivariate analysis, sampling, attitude measurement (scaling), and other quantitative analytic techniques utilized by social scientists. Prerequisite: consent of instructor.

582-4 Criminal Law and the Correctional Process. (Same as Administration of Justice 582.) Basic principles and administration of the criminal law and the legal foundations of the juvenile court, the sentencing process, parole and probation, and the changing concept of mental competency. Prerequisite: consent of instructor.

584-4 Seminar in Correctional Program Management. (Same as Administration of Justice 582.) Analysis of management influence on treatment programs in various correctional settings. Field trips, observation, and research in addition to readings. Prerequisite: consent of instructor.

595-2 to 15 Individual Research. Selection, investigation, and writing of a research topic under the personal supervision of a member of the departmental graduate staff. Prerequisite: consent of instructor.

599-1 to 9 Thesis. Minimum of 9 hours to be counted toward a degree. Prerequisite: consent of instructor.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Guidance and Educational Psychology

412-4 Mental Hygiene. A survey of principles concerning factors and conditions in personal life that tend to facilitate or deter mental health. Mental health viewed as living creatively in an atmosphere of satisfactory inter-personal relations. Prerequisite: 305.

422-8 (4,4) Construction and Use of Evaluation Instruments. (a) Theory and techniques of measurement. Construction and use of teacher-made tests. (b) Standardized tests and other measuring devices to reveal individual and group characteristics. Emphasizes application and interpretation for counseling, education, and research purposes. Prerequisite: 305.

442-4 Basic Principles of Guidance. Introductory course on student personnel services. Survey of philosophy, principles, and organization of guidance services. Prerequisite: 305.

481-2 to 12 Seminar. Conducted by staff members and distinguished guest lecturers on pertinent topics. Prerequisite: 305 and consent of instructor and department.

501-2 to 12 Special Research Problems. For majors in Guidance. Formulating, investigating, and reporting on a problem in the area of guidance. Prerequisites: advanced standing and consent of department.

505-4 Introduction to Statistical Methods. Covers such basic descriptive techniques as measures of central tendency and variability, graphical presentation of data, and various derived scores. Also correlation, sampling theory, and hypothesis testing.

506-4 Advanced Statistical Methods. Basic statistical inference techniques: correlation, hypothesis testing, confidence intervals, introduction to prediction and one-way analysis of variance. Prerequisite: 505.

507-4 Design and Analysis of Experiments. Systems of organizing and analyzing data so that maximum information can be obtained. Analysis of variance, factorial design, square designs, mixed designs, tests of homogeneity, analysis of covariance, and multiple linear regression. Prerequisite: 506.

511-4 Educational Implications of Learning Theories. Survey of the major theories of learning. Emphasizes the implications of these theories for classroom practice. Prerequisite: advanced standing.

515-4 Psychological Aspects of Education. Designed to survey the applications of psychology to educational settings. Prerequisite: advanced standing.

521-8 (4,4) Analysis of Classroom Behavior. Trains school psychologists and other school personnel to serve as a consultant to classroom teachers regarding (a) prevention and modification of undesirable classroom behaviors and (b) effective use of learning principles. Must be taken in a,b sequence. Prerequisite: 305.

530-4 Standardized Testing: Theory, Use, and Interpretation. Principles and procedures for studying individual pupils and their problems for guidance purposes. Emphasis on interview, observation, ratings, case study, cumulative record. Prerequisite: 505.

531-4 Theory of Measurement. Standardized tests and other measuring devices studied to reveal individual and group characteristics. Application and interpretation for counseling, education, and research purposes. Prerequisite: 505 or consent of instructor.

532-8 (4,4) Individual Measurement Theory. (a) Assessment of individual mental factors with attention to theories, test validation, analysis of intelligence, and related research. Historical review, test standardization, and interpretation of the Stanford-Binet and Wechsler Scales are emphasized. (b)

Discussion of problems in the administration of intelligence tests. Administration of the Stanford-Binet and the Wechsler intelligence scales for children. Must be taken in a,b sequence. Prerequisite: 505 or consent of instructor.

537-4 Counseling Theory and Practice. Systematic study of the assumptions and fundamental practices of major approaches to counseling. Observation and practice utilized to supplement didactic discussion. Prerequisite: consent of department.

541-4 Occupational Information and Guidance. For school counselors, industrial supervisors, and teachers to give an orientation to and experience with occupational information and vocational adjustment. Prerequisite: 442.

543-4 Guidance Through Groups. Study of the methods, techniques and materials for the organization and utilization of groups for guidance purposes. Prerequisite: 442.

545-2 to 4 Seminar. Doctoral seminar in behavioral foundations of education. Open only to students admitted to doctoral curricula who have completed 590.

546-8 (4,4) Personality Assessment. The review of related literature covers test development, standardization procedures, related research, and test interpretation. (a) Assessment of individual interests, motivations, and perceptual systems with attention to theories and assumptions of objective diagnostic tests. (b) Projective diagnostic tests, theories, and assumptions are stressed. Must be taken in a,b sequence. Prerequisite: 532a or consent of instructor.

548a-2 to 12 Practicum in Secondary Guidance. Supervised experience in group and individual guidance procedures with children and in working with parents and teachers. The development and organization of a secondary school guidance program is stressed, including the use and interpretation of occupational and other test materials appropriate for the secondary interpretation of occupational and other test materials appropriate for the secondary school. Prerequisite: 537 or consent of instructor.

548b-2 to 12 Practicum in Elementary Guidance. Supervised experience in group and individual guidance procedures with children and in working with parents and teachers. The development and organization of an elementary school guidance program is stressed, including the use and interpretation of occupational and other test materials appropriate for the elementary interpretation of occupational and other test materials appropriate for the elementary school. Prerequisite: 537 or consent of instructor.

548c-4 to 8 Practicum in Counseling. Practical experience at the appropriate grade level in counseling with a representative sample of the population. Includes counseling and listening to recordings of counseling sessions individually or in groups. Prerequisite: consent of instructor.

548d-2 to 8 Practicum in School Psychology. Supervised experience to help the student work effectively as a psychologist in the school setting. Focuses on the application of specific psychological skills, the teacher consultation, and program planning for educationally handicapped children. Prerequisite: consent of instructor.

553-2 to 4 Organization and Administration of Guidance and Pupil Personnel Services. Principles, procedures, and plans necessary for initiating, developing, and appraising a school guidance program. Prerequisite: 537.

555-2 to 12 Seminar in School Psychology. Major professional issues and responsibilities; the school as a social system; ethical considerations; school related agencies and facilities; and professional organizations. Assists the student prepare the project proposal required for the specialist's certificate. Prerequisite: consent of instructor.

562-8 (4,4) Human Development in Education. Theories and research evidence regarding child development and behavior are investigated. These considerations focus upon implications for research and educational practices. (a) Childhood. Prerequisite: advanced standing. (b) Adolescence. May be taken in a,b sequence.

567-2 to 12 Topical Seminar in Educational Psychology. Contemporary topics and problems in the area of educational psychology. Conceptual and empirical activities. Prerequisite: consent of instructor.

568-2 to 16 Topical Seminar in Counseling and Guidance. Issues in counseling, counseling theories, research methodology, contemporary and classical research design, modern trends in applied research. Prerequisite: consent of instructor.

580-2 to 10 Topical Seminar in Statistics and Measurement. Discussion and

practical experience in dealing with advanced statistical and measurement problems. In-service training is available for advanced graduate students. Prerequisite: consent of instructor.

581-1 to 12 Specialized Practicum in Counseling, Guidance, and Counselor Supervision. Prerequisite: 548c.

590-2 Seminar in Behavioral Foundations. A course required of all students beginning advanced graduate study. Students examine empirical modes of inquiry and empirical formulations of learning behavior. Topics explored include the classroom as a social system, the learner, learning models and data language. (Taken concurrently with Educational Administration 591. Prerequisite: formal admission to Doctor of Philosophy studies.)

596-2 to 12 Independent Investigation. For specialist's certificate students. Prerequisite: consent of instructor.

597-1 to 10 Independent Study. For doctoral students in educational psychology. Formulating, investigating, and reporting on research problems in the area of guidance and educational psychology. Prerequisite: consent of department.

599-1 to 9 Thesis. Prerequisite: consent of department.

600-1 to 48 Dissertation.

Health Education

400-4 Health Appraisal of School Children. The role of the teacher in the health appraisal of the school child, including school health examinations, use of health records, and emphasis on training for recognition of health deviations from normal common among school children. Not open to students who have had 450.

405-4 Sex Education in Schools. Problems of teaching sex education in schools. Designed to meet state requirements for preparation of teachers.

415s-3 to 4 Workshop in Driver Education and Traffic Safety. Summer course designed for pre-service and in-service teachers of driver education and traffic safety. Individual and group problems will be treated. Lectures by safety authorities, demonstrations, field trips, audio-visual materials, and individually supervised research in special problem areas. Prerequisite: 302 or equivalent.

426-3 Knowledge Testing in Health Education.

442s-4 Practicum in Driver and Traffic Safety Education II. Provides prospective teachers with dual-control, simulation, and multiple-car laboratory teaching experiences. Teaching beginners, developing programmed lessons, methods, and materials of instruction included. Prerequisite: 302s.

443s-4 Driver and Traffic Safety Education Program Administration III. Includes a study of program administration, supervision, and planning. Prerequisite: 442s.

445s-4 Driver Simulation. For in-service and pre-service teachers and supervisors of driver and traffic safety education. Methods of instruction, equipment familiarization, program development and objectives. Prerequisite: 443s or consent of the instructor.

450-4 Health Education in the Elementary School. Responsibilities of schools to instruct their students in basic fundamentals of how to live healthfully. Principles, methods, programs and materials for the elementary teacher. The integration of health with other subjects, health observation of children, abnormalities, screening tests, and related materials. Not open to students who have had 400.

460-4 School Health Program. Shows the prospective teacher the fundamental processes involved in the teaching of health education at the secondary level.

461-4 Workshop in Health Education. Summer course for in-service teachers, administrators, advanced students, nurses, social workers, and others interested in public health aspects of school and community living. Individual problems of classroom health treated as units in such fields as speech defects and their detection and correction, communicable disease control, nutrition, social and mental hygiene. Lectures, demonstrations, films, field trips, and individually supervised research in special problems. Prerequisite: 100 or its equivalent.

462-4 Health Education Workshop. A continuation of 461 with emphasis on total school health teaching objectives.

463-1 to 4 Workshop in Health Education with Emphasis in Disaster Preparedness. A continuation of 462.

464-4 Workshop in Alcohol and Drug Education. Summer workshop for those responsible for teaching about alcohol and drug substances. Emphasis on motivations for use, nonuse, and abuse and on the varieties of effects in the young and the older. Translates concepts, ideas, and information into teaching materials and approaches.

470s-4 Highway Safety as Related to Stimulants and Depressants. Relationship between alcohol and drugs and traffic accident causes. Concepts and educational programs designed to alleviate alcohol and drug related accidents. Prerequisite: advanced standing or consent of instructor.

471-4 Organization and Administration of School Health. Appraisal of overall school organization for health education, including health service and personnel, health and safety instruction, school environment, school health examination, local, state, and federal resources for health, health councils, and interdepartmental relationships.

475s-3 Traffic Law Enforcement and Planning. Acquaints Safety and Driver Education teachers with the purposes of traffic law enforcement and engineering and the methods used to fulfill these purposes on ways of improving existing services. Prerequisite: 433s or consent of instructor.

480s-4 Workshop in Safety Education. Summer course for in-service teachers, nurses, administrators, advanced students, and others interested in safety education as it applies to the public school and the community. Individual problems, lectures, demonstrations, films, field trips, and individual group study in special areas of interest. Prerequisite: 313 or 323 or consent of instructor.

481s-4 Safety Education Workshop. A continuation of 480s with emphasis on methods and evaluation of total school safety education. Prerequisite: 314s or 323s or 480s or consent of instructor.

485-4 International Health. A survey and analysis of the health beliefs, values, and practices of peoples in other cultures, with particular attention to how these beliefs and practices fit into a total way of life. An international orientation of potential value to both prospective teachers and students in other fields.

488-4 Health Education Aspects of Environmental Sanitation. Application of principles of learning to man's contacts with his environment: water, food, air, radiation, housing, and refuse. Emphasis is placed upon both individual and community aspects of environmental health. Prerequisites: 100, 205, or equivalent.

489-4 Introduction to Vital Statistics. An introduction to bio-statistics; examination of theories of population growth; understandings of collection, organization, summarization, presentation, evaluation, and interpretation of data relative to biological happenings. Prerequisite: Mathematics 120 or equivalent.

490-2 to 12 Field Work in School and Community Health. Field training, observation, and participation in current public agency and school health programs. Provides practical experience for the health education student. Restricted to majors in the department or by special permission of the instructor.

491-4 Health Teaching Methods in School and Community. Various dimensions of teacher-student relations in the classroom with emphasis on the multiple roles of the teacher. Prerequisite: 305, 471, or consent of instructor.

495s-4 Driver Education for the Handicapped. Methods and techniques designed to teach handicapped persons how to drive. Consideration of programs for EMH and physically handicapped. Familiarization with assistive equipment and program materials. Prerequisite: advanced standing or consent of instructor.

500-4 Community Organization for Health Education. Review of the philosophies of community organization for health; techniques of group work, current research in community organization and examination of programs of community health agencies.

510-4 Construction of the Curriculum in Health Education and Safety. Review of health and safety instruction programs in elementary and secondary schools, consideration of health and safety needs and interests and their relationships to the curriculum, evaluation of health texts, and evaluation of current research.

511-5 Practicum in Health Education Workshop. Designed to give graduate and post-graduate students experiences in organizing, planning, and operating in-service training programs through workshop methods.

515-4 Review of Current Literature in Health Education, Public Health and Safety Education. A survey and analysis of the newer publications in the related fields of health education, public health, and safety education.

520-4 to 6 Special Projects in Health Education and Safety. Detailed research and study on advanced problems in the fields of public health, safety education, and health education.

525s-4 Organization, Administration, and Supervision of Safety Education. Designed to give the student basic principles of organization, administration, and supervision of safety education. Problems, policies practices, and methods involved in the organization and administration of a safety education program.

526-4 Evaluation in Health Education and Safety. Surveys and analyses of health and safety testing and evaluation, procedure includes surveys; inventories; knowledge, behavior and attitude tests; check lists; and questionnaires, their uses and limitations. Evaluation of total school health and safety program is emphasized. Prerequisite: consent of department.

530s-4 Problems and Research in Accident Prevention. Principles of accident prevention, causes of accidents, problems of behavior in school, home, traffic and transportation. Prerequisites: 443s, 525s, or consent of instructor.

533a-4 Human Conservation. An analysis of community health problem trends and changes including aging; chronic and degenerative diseases; mental illnesses; traumatic illness, injuries, and defects; radiological hazards; communicable diseases; and maternal and child health problems. An epidemiological approach to the cause, nature, extent, and trends in erosion and wastage of human resources. Prerequisite: permission of instructor.

533b-4 Human Conservation II. An analysis of community structures in relation to positive health services, education, and health living in respect to community health problems and health requirements. A study of trends in programming to meet minimum health requirements and to care for or ameliorate existing health problems and hazards on a communitywide basis. Prerequisite: 533.

533c-4 Human Conservation III. An analysis of the unmet health needs or requirements for optimum conservation of human resources in the community including a study of pilot and experimental programs and research in community efforts to meet health needs and solve existing health problems. An evaluative approach to existing health programming and research including an analysis of further needed experimentation and research and possible sources for leadership and funds for promoting community health research, programmings, and plannings. Prerequisites: 533a,b.

536-4 Professional Preparation in Health Education. National, state, local factors influencing teacher preparation in health education, including accreditation of teacher education programs, certification of health education teachers. Undergraduate and graduate curricula developed and analyzed.

540s-1 to 4 Readings in Traffic and Safety Education. For advanced students. Prerequisite: 24 hours of traffic and safety education course work, advanced graduate standing, and consent of instructor.

545s-4 Externship in Traffic and Safety Education. Laboratory and field experience with local, state, or national traffic or safety organizations. Prerequisite: advanced graduate standing and consent of instructor.

550s-4 Current Developments in Driver and Safety Education. Current problems, trends, and developments reviewed, analyzed, and evaluated relative to driver and safety education. Prerequisite: advanced graduate standing and consent of instructor.

590-4 to 12 Field Internship. Full quarter of field work with an approved department of public health or voluntary health agency under the supervision of the agency officer in charge and the supervisor from the Department of Health Education.

597-3 (1,1,1) Seminar in Health Education and Safety. Devoted to discussing individual health and safety projects, presenting research problems, and preliminary presentation of dissertation topics.

599-3 to 9 Thesis.

600-1 to 48 Dissertation. The dissertation for the Doctor of Philosophy degree in the College of Education must meet the minimum requirements of 36 hours.

Higher Education

402-2 Principles of Student Personnel Group Work. Acquaints the student with group work possibilities and functions in higher education.

510-4 Higher Education in the United States. An overview of American higher

education: its development and scope, organizations and functions, issues and criticisms.

512-4 Higher Education in Selected Nations. Study of higher education systems and trends outside the United States, and of the university in world affairs.

513-4 Organization and Administration in Higher Education. Theories and practices in governance of various types of higher education institutions with attention, through case studies, to problems of formal and informal structures, personnel policies, decision-making, institutional self-study, and societal-governmental relations.

515-4 College Student Personnel Work: Operations and Policies. Study of organization, functions, and undergirding policies of student personnel services and programs in contemporary colleges and universities.

516-4 College Student and College Culture. A study of the nature of the student, the impact of the college on student development, the nature of the college as a unique social institution, and the interaction between the student and his institution.

518-4 College Teacher and College Teaching. Study of contextual roles of academic man as teacher, scholar, and faculty member; of teaching-learning processes, programs, and evaluations; and of professional values, including academic freedom.

522-1 to 12 Readings in Higher Education. Supervised readings in aspects of such general areas in higher education as college teaching and learning, central administration, college student services, policy issues, or history of higher education. Prerequisite: consent of instructor.

523-1 to 12 Internship in Higher Education. Supervised field experience in appropriate settings, with evaluative seminars. (a) College Teaching. (b) College Student Personnel. (c) College Administration. (d) Institutional Research. Prerequisite: consent of department.

524-2 to 6 Individual Study. Individual inquiry into selected problems in higher education. Prerequisite: consent of instructor.

535-2 Higher Education Seminar I. A series of seminars for specialized areas of administrative practice and policy. (a) Educational Programming in Student Housing. (b) Business Administration of Student Housing. (c) Student Personnel Group Work. (d) Non-Academic Personnel Management. (e) Problems in Central Administration. (f) Business and Fiscal Administration. (g) Academic and Faculty Administration. (h) Administration of Admissions and Records. (i) Junior College Administration. (j) The Technical Institute. (k) Adult and Continuing Education. (m) Institutional Research. (p) Development and Management of Organized Research.

545-3 Higher Education Seminar II. A series of seminars for reflective and scholarly inquiry into significant domains in higher education. Prerequisite: consent of instructor. (q) History of Higher Education. (r) Sociology of Higher Education. (s) Law, Legislatures, and Higher Education. (t) Aesthetics and Higher Education. (v) The Federal Government and Higher Education.

551-4 Curriculum Design and Policy. Study of assumptions, materials, method, and evaluation in the designs of various curricula in colleges and universities, with attention to curriculum resources and policy.

555-4 Philosophy of Higher Education. (Same as Philosophy 555.) Critical examination of assumptions and aims, operations and consequences, and basic concepts and symbols of higher education from philosophic perspectives.

565-4 The Community-Junior College. A study of the nature and function of the junior (or community) college in American higher education, and its relationships to the community and other educational institutions. Course content treats special problems of curriculum, student services, finances, faculty selection and growth, and general policy.

578-4 Economic Aspects of Higher Education. A study of economic aspects of higher education in American society. The emphasis on sources and management of college and university financing includes budgeting, control, and current trends.

589-4 to 6 Advanced Research. Selection, investigation, and writing of a special research project under the personal supervision of a graduate faculty member. Prerequisite: consent of instructor.

595-1 to 12 Higher Education Seminar III. Varied content. Prerequisite: consent of instructor.

599-1 to 9 Thesis.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

History

401-9 (3,3,3) History of the South. Social, economic, political, and cultural developments of the South. (a) To 1850. (b) 1850-1900. (c) Since 1900.

403-6 (3,3) American Economic History. (a) to 1800. (b) 1800-1900.

404-3 Democracy, Nationalism, and Sectionalism, 1790-1828. Issues and conflicts which dominated the American political scene prior to the emergence of Jacksonian democracy. Prerequisite: GSB 300a.

405-6 (3,3) United States History 1850-1896. (a) Civil war. (b) Reconstruction and industrialization. Prerequisite: GSB 300b or consent of the instructor.

406-6 (3,3) Diplomatic History of Europe. (a) From the Congress of Vienna to the Fall of Bismark (1815-1890). (b) From 1890 to the present.

408-6 (3,3) Problems in Black American History. Developments which formed the foundation for the "Black Revolution" of the present time. Prerequisite: 6 hours of 300-level social science courses or consent of instructor.

409-9 (3,3,3) U.S. Constitutional History. A content and research course involving origin and development of the American constitution, from English background through the convention to the present. (a) To 1830. (b) 1830 to 1912. (c) 1912 to present.

410-2 to 5 Special Readings in History. Supervised readings for students with sufficient background. Registration by special permission only. Offered on demand.

411-9 (3,3,3) Social and Intellectual History of the United States. (a) 1607-1830. (b) 1830-1900. (c) 1900 to present. The development of American society and a study of various types of economic, social, and political thought that have influenced it.

414-9 (3,3,3) Intellectual History of Modern Europe. (a) The Enlightenment, (b) The 19th century, (c) The 20th century.

416-6 (3,3) Early Modern Europe. (a) Renaissance. (b) Reformation. Prerequisite: Six hours of 300-level social science or consent of the instructor.

417-9 (3,3,3) Advanced English History. (a) The Empire-Commonwealth. (b) Constitutional history. (c) English culture in the age of the American Revolution. (d) Tudor England.

419-6 (3,3) Europe in the Age of Absolutism. (a) 1648-1715. (b) 1715-1789. Prerequisite: Six hours of 300-level social science or consent of instructor.

420-4 The French Revolution. A sketch of the passing of feudalism in France, the background and development of the revolutionary movement, and the Napoleonic period.

425-6 (3,3) American Colonial History. (a) Discovery and Settlement, (b) British Imperial structure.

428-3 The Age of Jackson. Origins, background, and development of that phase of American democracy associated with the Jacksonian era. The political, social, and economic history of the years 1815-1844.

430-9 (3,3,3) Late Modern Europe. Problems in the political, social, and military history of Europe in the twentieth century. (a) First World War and interwar years. (b) Second World War years. (c) Since 1945. Prerequisite: GSB 100b or 333c.

434-9 (3,3,3) Social and Political History of Modern Europe. (a) 1815-1850. (b) 1850-1885. (c) 1885 to World War I. Changing social structure of Europe caused by industrialization. The consequence of this development in terms of the emergence of new social forces and political problems. Prerequisite: GSB 100b.

435-9 (3,3,3) Twentieth-Century United States History. Important developments in recent United States history. (a) 1896-1919. (b) 1919-1937. (c) 1937 to present. Prerequisite: GSB 300c or consent of instructor.

440-9 (3,3,3) History of American Diplomacy. Important treaty relations of the United States, and a general consideration of American foreign policies. (a) America in isolation (to 1860). (b) The emerging America (from 1860 to 1920). (c) America on the world scene (1920 to the present). Prerequisite: 6 hours 300-level social science or consent of instructor.

442-9 (3,3,3) History of the West. (a) Colonial. (b) Trans-Allegheny. (c) Trans-Mississippi.

- 448-6 (3,3) **History of Southeast Asia.** (a) To 1900. (b) 1900 to present.
- 449-6 (3,3) **Advanced African History.** (a) Cultural history of traditional states, the slave trade, and the interaction of traditional systems and European culture. (b) Investigations into the most important historical questions and interpretations of the regions covered in (a). Prerequisite: 349a,b, or c, or consent of instructor, or graduate standing.
- 451-3 **Great Historians.** Writings of historians from Herodotus to Toynbee. Prerequisite: 6 hours of 300-level social science courses or consent of instructor.
- 452-3 **Methods of Historical Research.** Fundamentals of historical investigation, criticism, and composition. For concentrations in history only.
- 455-3 **History of Inner-Asian Relations.** Tribes, migrations, wars, and power politics in Central Asia and outlying areas of China from Han times through 19th century rivalries to latest development along the Sino-Soviet frontier.
- 460-9 (3,3,3) **Social and Institutional History of the Middle Ages.** (a) Ecclesiastical. (b) Seigneurial. (c) Urban.
- 461-6 (3,3) **Cultural and Intellectual History of the Middle Ages.** (a) Early Middle Ages. (b) High Middle Ages.
- 463-6 (3,3) **History of France.** French social, economic, political, and intellectual evolution from medieval origins to the present day and of the French contributions to Western culture. Prerequisite: 6 hours 300-level social science, or consent of department.
- 464-6 (3,3) **History of Germany.** (a) German state and society from the Middle Ages to the early 19th century. (b) Germany since 1815. Prerequisite: Six hours of 300-level social science or consent of instructor.
- 465-6 (3,3) **History of Russia.** (a) Traditional Russia to 1905. (b) Revolutionary Russia Since 1905.
- 470-3 **Argentina and Chile.** A narrative and comparative study of the independent era of the history of these two leading states of South America.
- 471-6 (3,3) **History of Mexico.** (a) 19th century. (b) 20th century. Significant political, economic, diplomatic, social, and cultural aspects of Mexican life from independence to modern Mexican life.
- 472-3 **Colonial Latin America: Policies and Practices.** Theory and operation of the colonial system. Prerequisite: 6 hours of 300-level social science courses or consent of instructor.
- 473-6 (3,3) **The Caribbean Area.** (a) In the 18th and 19th centuries. (b) In the 20th century. An inquiry into the changing role of the political, economic, strategic and cultural nature of this Mediterranean of the New World.
- 474-3 **United States-Mexican Relations.** Relations between the United States and Mexico. Prerequisite: 6 hours of 300-level social science courses or consent of instructor.
- 475-6 (3,3) **Dictatorship in Latin America.** A political, economic, social and military study of the domestic and international aspects of dictatorship. (a) 19th century. (b) 20th century. Prerequisite: junior standing.
- 476-3 **Andean South America Since Independence.** A narrative and comparative study of Bolivia, Colombia, Ecuador, and Peru in the nineteenth and twentieth centuries. Prerequisite: 6 hours of 300-level social science or consent of department.
- 477-3 **Brazil Since Independence.** Cultural, diplomatic, military, political, and socio-economic elements of Brazilian life from independence to the current era. Prerequisite: 6 hours of 300-level social science or consent of instructor.
- 478-9 (3,3,3) **History of Spain.** Institutional intellectual, socioeconomic, and political history from the middle ages to the present. (a) Medieval Spain (to 1500). (b) The Imperial Period (1469-1825). (c) Modern Spain (since 1808). Prerequisite: 6 hours of 300-level social sciences courses or consent of instructor.
- 481-6 (3,3) **History of Rome.** (a) Rome from republic to empire, 133 B.C.-A.D. 14. (b) Roman Empire to the death of Constantine. Prerequisite: Six hours of 300-level social science or consent of instructor.
- 490-3 **Problems in United States History.** Topics vary with instructor. May be repeated for a maximum of six quarter hours provided registrations cover different topics. Topics announced in advance. Prerequisite: consent of instructor.
- 498-6 (3,3) **History Honors.** Principles of historical method, research, and writing for senior honor students only. (a) Methodology. (b) Research, honor thesis. Prerequisite: 398.
- 500-4 to 10 **History Seminar.** (a) American history. (c) Latin American history.

- 509-4 Studies in Negro History.** Readings, discussions, and papers, of selected areas of Negro life and thought.
- 510-2 to 3 Readings in History.** Individual readings. Graded S/U only. Prerequisite: consent of department.
- 514-4 Studies in Asian History.** Pro-seminar course on select topics in Asian History. Prerequisite: consent of department.
- 515-8 (4,4) Seminar in Twentieth Century United States History.** United States history since 1896 with emphasis upon politics and political behavior. Prerequisites: graduate status.
- 518-4 England in the Age of the "Glorious Revolution."** An analysis of the ideas and forces that converted the English government into a liberal state with an emphasis on the concepts and principles later applied in the establishment of the American Constitution.
- 519-8 (4,4) The Age of Jefferson.** Rise and development of Jeffersonian Democracy, 1790-1824, with emphasis upon social, economic, and political programs of Republicans and Federalists; the clash of mercantile and agrarian interests.
- 520-8 (4,4) Sectionalism and Reform.** Study of major political, economic, and social issues, 1820-1850, which divided the United States and prepared the way for civil war.
- 521-8 (4,4) Seminar in American Diplomatic History.** A content and research course concerning selected studies in American diplomacy. Prerequisite: 6 hours of 300-level social science or consent of instructor and 440.
- 522-8 (4,4) Seminar in American Economic History.** (a) Reading seminar in the economic aspects of American history. (b) Research seminar problems. Prerequisites: Economics 214 or 215 or consent of instructor.
- 523-8 (4,4) Seminar in American Social History.** Research and writing in selected topics relating to the development of American society and institutions. Prerequisite: consent of instructor.
- 524-8 (4,4) Seminar in American Constitutional History.** (a) Reading seminar devoted to the important literature in constitutional history. (b) Research seminar in which the student will closely investigate a significant topic. Prerequisite: consent of instructor.
- 525-8 (4,4) Seminar in American Colonial History.** Advanced research in specific areas of American Colonial history. Prerequisite: consent of instructor.
- 553-4 New Viewpoints in American History.** New interpretations and recent developments in American history. Prerequisite: GSB 300.
- 568-8 (4,4) Seminar in Illinois History.** A seminar in selected topics in Illinois history, 1818-1918. Prerequisite: consent of instructor.
- 574-4 United States-Mexican Relations.** A content and research course concerning international relations between the United States and Mexico.
- 575-12 (4,4,4) Studies in Latin American History.** A content and research course concerning selected studies in Latin American history.
- 582-4 to 8 (4) Studies in Medieval and Renaissance History.**
- 583-8 to 16 (4,4) Seminar in Medieval and Renaissance History.**
- 586-4 to 8 (4) Studies in Early Modern European History.**
- 587-8 to 16 (4,4) Seminar in Early Modern European History.**
- 590-4 to 8 (4) Studies in Modern European History.** Prerequisite: graduate standing or permission of department.
- 591-8 to 16 (4,4) Seminar in Modern European History.** Prerequisite: graduate standing or permission of department.
- 598-3 (1,1,1) Teaching History in College.** Required of all first-year teaching assistants.
- 599-1 to 9 Thesis.** Minimum of 5 hours to be counted toward a master's degree.
- 600-1 to 48 Dissertation.**

Home and Family

- 407-2 to 8 Workshop.** Aids workers in professions related to home and family.
- 423-4 Advanced Family Housing.** (Same as Clothing and Textiles 423.) Further appreciation and understanding of aesthetic, economic, psychic, and social factors influencing choice of family housing today. Prerequisite: 323.
- 445-4 Administration of Pre-School Program.** Objectives in pre-school programs. Programming, including housing, equipment, health protection, and supervision. Field trip. Prerequisite: 345b or consent of instructor.
- 456-4 Infant Development.** Current theories and knowledge concerning growth

and development of infants with related laboratory and field experiences. Prerequisite: 237 or Psychology 301 or equivalent.

466-2 Practicum in Parent-Child Study. Designed to increase student's ability to work with parents and parent groups through an awareness of factors in the parent-child relationship and knowledge of current research and methods in parent education. Integration with infant and child development laboratories and related field experience. Prerequisites: 227 and 237 or equivalent.

500-4 Research Methods. The nature of the scientific method and basic techniques in home and family research as applied to the collection, analysis and interpretation of data. Prerequisite: Guidance 505.

540-4 Trends in Consumer Problems. Social, legal, and economic problems that pertain to the consumer. Selection of individual problems for investigation. Prerequisite: 341 or equivalent.

550-4 Advanced Home Management. Readings, observations, projects, and discussions on selected problems with emphasis on time, money, energy, and family relations. Prerequisites: 331 and 332 or equivalent.

556-4 The Pre-School Child. Growth of the child from birth to six years with emphasis on the various aspects of growth and their interrelationships.

562-4 Child Development Through Home and School. The normal, healthy development of children as it takes place in the home and is promoted by the curriculum and other school activities.

566-4 Interpersonal Relationships Within the Family. Factors that promote satisfactions within the immediate family. Prerequisites: 227 or GSB 341, 237, and 331.

571-4 Recent Research. Review of selected research in various phases of home economics in related fields. Sources of research include colleges, universities, and governmental and industrial agencies. Offered on demand.

572-2 to 8 Special Problems. For students recommended by their chairman and approved by the head of the department and the instructor in charge for independent work or directed study.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-3 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Home Economics Education

414-4 Home Economics for Elementary Teachers. Units of work in nutrition, school lunches, family and social relationships, textiles, and clothing.

415-1 Introduction to Graduate Study. Seminar to orient the student to graduate work through relation of courses to goals of program, standards of work, habits of thinking, communication of ideas, uses of professional materials and publications. Required. Students should take at first opportunity.

481-2 to 6 Readings. Supervised readings for qualified students. Prerequisite: consent of instructor and chairman of department.

485-3 Principles and Philosophies of Vocational and Technical Education. (See Occupational Education 485.)

500-4 Research Methods. Methods employed in research in home economics education with special study of one according to interest and needs of student. Development of prospectus. Prerequisite: 505.

505-4 Home Economics in Secondary Schools. Consideration of the curriculum for homemaking education in the secondary school. A critical survey of resources. The place of homemaking education in the school and community.

506-4 Evaluative Procedures in Home Economics. Principles and procedures underlying appraisal and evaluation. Development and critical consideration of instruments for appraising pupil growth and the program of instruction. Emphasis placed on values.

507-2 to 8 Workshop. Designed to aid home economics teachers, supervisors, and leaders in the field with current problems. Resource people are used. Discussions, reports, lectures, and other methods of analyzing and working on solutions to problems. Emphasis for the workshop will be stated in the announcement of the course.

510-4 Supervision of Home Economics. Nature, function, and techniques of supervision at all levels. Emphasis given to supervision of student teachers. Experience in the field will be provided for qualified teachers.

510A-1 to 4 Practicum in Supervision. Experience in using a variety of tech-

niques at various levels and areas of supervision both on and off campus. Prerequisite: 510 or Educational Administration 556 or consent of instructor.

515-4 Trends and Issues in Home Economics Education. Current trends, problems, needs in the field. Attention given to problems and needs of students.

516-4 Advanced Methods of Teaching Home Economics. Recent trends in methods based on research and experimental programs; furthering good relations in homemaking classes as means of clarifying and accomplishing goals; teacher's role; techniques useful in furthering good relations within group and in meeting individual needs. Emphasis given to social significance of these procedures.

517-4 Methods and Materials for Adult Programs in Home Economics. Philosophy of adult education; unit planning, methods, techniques, and resources useful in adult homemaking programs.

525-4 Cooperative Vocational-Technical Education. (See Occupational Education 525.)

571-4 Recent Research. Review of selected research in various phases of home economics in related fields. Sources of research include colleges, universities, and governmental and industrial agencies. Offered on demand.

572-2 to 8 Special Problems. For students recommended by their chairman and approved by the head of the department and the instructor in charge for independent work or directed study.

573-1 to 6 Seminar: Research in Home Economics. Presentation of prospectus outlines, research projects, problems for research, progress reports of research by graduate students and faculty. Prerequisite: consent of instructor.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-3 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Instructional Materials

400-2 Library Research Methods. Introduction to the use of library materials in graduate research. Includes a survey of scholarly publishing and the use of reference works in various subjects.

401-4 Introduction to Cataloging. Organization of library materials. Emphasis on cataloging and classification. Acquisition and the processing procedures. Both the Dewey Decimal and Library of Congress classification schemes studied. Laboratory assignments.

403-4 School Library Functions and Management. Effective library services in relation to the educational objectives of elementary and secondary school programs: organization, supervision, finance, housing, equipment, standards, and evaluation.

405-4 Library Materials for Children. Study of the aids, methods, and criteria for the selection and use of books and other instructional materials for children in the elementary schools.

406-4 Library Materials for Adolescents. A study of the aids, methods, and criteria for the selection and use of books and other instructional materials for students in the high school.

407-4 Basic Reference Sources. Evaluation, selection, and use of reference sources for elementary and secondary school libraries. Principles and methods of reference service.

413-4 Cataloging Non-Book Materials. The classification, cataloging, preparation and circulation of all types of non-book material such as films, filmstrips, slides, realia, etc. Prerequisite: 308.

417-4 Audio-Visual Learning Methods in Education. Selection and utilization of instructional materials in the learning environment, elementary through adult levels. Audio and visual materials and procedures are emphasized with some attention given to bibliographies and reference books for teachers.

420-4 School Library Activities and Practice. Supervised practice and observation integrated with instruction in the typical activities of school librarianship; storytelling, publicity, developing units of library instruction, and work with students. Prerequisites: 308, 403, 405, or 406 and 407.

440-4 Photography for Teachers. Photography as a tool of communication in the modern school. Techniques of camera handling, visually planning a story, macrophotography, color slides.

445-4 Preparation of Teacher-Made Audio-Visual Materials. Laboratory practice in the preparation of bulletin boards, opaque materials, models, slides, recordings, feltboards, and other graphic materials. Prerequisite: 417 or consent of instructor.

448-4 Supervision and Administration of an Audio-Visual Program. Provides professional information and training for anyone who has administrative responsibilities for an audio-visual program. For teachers, coordinators, or directors. Prerequisite: 417 or consent of instructor.

450-4 Classroom Teaching with Television. Classroom utilization of open and closed circuit television. Emphasis is placed on the changed role of the classroom teacher who uses television. Evaluation of programming, technicalities of ETV, and definition of responsibilities are included. Demonstration and a tour of production facilities are provided.

457-4 Radio and Television in the Classroom. Educational programs and their value to the teacher in the classroom. Sample tapes of radio programs and kinescopes are used.

458-4 The Medium of the Motion Picture. A study of the full range of expression by motion pictures including documentary, theatrical, educational, experimental, and industrial films. Representative films are screened.

470-4 Programming Automated. The principles and practice of writing both linear and intrinsic types of programmed instruction with emphasis on pictorial and performance branches. Individual experience in planning and producing programs.

505-4 Literature of the Humanities. Book selection and reference. Emphasis on literature, philosophy, music, and art. The philosophy and techniques involved in using major reference tools efficiently in the library. Prerequisite: Instructional Materials 407.

506-4 Literature of the Social Sciences. Book selection and reference in the fields of history, political science, economics and business, sociology, anthropology, and other closely related fields. Includes basic terminology, structure of literature, and problems of bibliographical control and information retrieval. Prerequisite: 407.

510-4 Mass Communications in Education. The use of mass media in the classroom. Includes radio, TV, comic books, newspapers, magazines, movies.

514-4 Survey of Research and Development in Instructional Materials. Advanced readings in research in instructional materials and the practical application of findings. Prerequisites: 405, 406, 417 or consent of instructor.

523-4 Seminar on Junior College Librarianship. Problems of particular significance to the junior college librarian: organization, materials, responsibilities, standards, and evaluation.

530-4 History of Media. The evolution of print from cuneiform tablets to the mass printing presses. The invention of photography, the motion picture, the electronic age of radio, television, and the laser. The change in storage of information from clay tablets to microfiche.

545-4 Cooperative Design of Instructional Materials. Students work on a one-to-one basis with faculty members in acquiring skills of instructional design. Students play, produce, and evaluate learning materials designed to meet specific teaching and learning problems. Prerequisite: 417, 445.

546-4 Integration of Audio-Visual Materials in the Classroom. Selection of materials on the basis of curricular needs. Techniques of evaluating each type of audio-visual material for use in the classroom. Structured for both the audio-visual administrator and the class room teacher. The principles and practices of integrating audio-visual materials into the curriculum are discussed, also the problems, annotations and classification of evaluated materials. Prerequisites: 417, or consent of instructor.

547-4 School Film and Filmstrip Production. Simplified techniques for teachers and audio-visual coordinators who may need to produce school-made films and filmstrips to meet local school problems. Prerequisites: 417 and 440 or consent of instructor.

549-4 Visual Learning. Learning from pictures in the classroom, the design of still and moving pictures, pictures used in testing perception, and the place of pictures in advertising and communication. Prerequisite: consent of instructor.

554-4 Administration of an Instructional Materials Center. Based on the concept of a single agency in the school that encompasses all forms of instructional materials. It is designed to further the training of specialists in

the supervision and administration of integrated audio-visual and library programs. Prerequisite: 403.

560-4 Seminar in Instructional Materials. Designed to give advanced graduate students an opportunity to investigate and discuss topics in instructional materials before the seminar group. Topics selected would depend on background and interest of individuals. Prerequisite: consent of instructor.

570-4 to 12 Practicum in Instructional Materials. Supervised experience in a public school, junior college, or university. Practical experience in administration, supervision, and production in an instructional materials center. Prerequisite: 417, 445, and consent of chairman of the department.

576-2 to 8 Problems in Instructional Materials. Opportunity for individual study of selected problems. Prerequisite: consent of instructor.

599-5 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Dissertation.

Interior Design

418-2 to 8 Workshop. Current problems facing the professional interior designer. Discussion, reports, lectures, design solution presentations, and other methods of analyzing and working on design problems. Prerequisite: consent of chairman.

470-4 Interior Design Seminar. Development of systematic approach involving systems analysis, human factors engineering, environmental variables. Prerequisite: consent of chairman.

481-2 to 6 Readings. Individual interests in design-related research. Prerequisite: consent of chairman.

Journalism

401-3 International Journalism. A study of the history, development, current status, and implications of the press and news services of other countries and their relationship to the international communications system. Prerequisite: senior standing.

421-4 School Publications. Designed for the prospective journalism teacher or high school publications director. Deals with practical production problems of newspapers and yearbooks.

422-3 Teaching High School Journalism. Teaching methods of journalism in secondary schools, organization and course of study, bibliography, use of journalism courses for school publications production.

431-3 Public Relations. Current methods of planning and executing public relations policies; evaluation of media; preparation of campaigns. Prerequisite: senior journalism majors only.

432-4 Foundations of Mass Communications Theory. Construction of communication theory, development of communication models, and relation of empirical investigations to theories of mass communication. Prerequisite: graduate standing, or consent of instructor.

433-8 (4,4) Research Theory and Design. (a) Research design, sample selection, and methods appropriate to field, experimental, and survey research. (b) Research Methods. Series of research projects utilizing a variety of research methods. Class discussion precedes and follows each project. Prerequisite: 432 or consent of instructor.

442-3 The Law of Journalism. Legal limitations and privileges affecting communications; fair comment, criticism, contempt of court, right of privacy, copyright, and legal provisions affecting advertising. Prerequisite: senior journalism majors only.

445-4 Specialized Writing. Researching and writing about areas of special interest such as education, mental health, and home economics. Prerequisite: consent of instructor and chairman.

449-2 to 8 Practicum. Study, observation, and participation in publication supervision. Prerequisite: consent of department.

450-3 Mass Media Management. Basic economic theory of the firm. Management science. Operations research. Computer utilization. Media production technology. Readings and seminar discussions. Prerequisite: 370, 383a, and GSB 211a or equivalent, or consent of instructor.

- 455-3 Seminar on Media Problems.** Readings and weekly seminar discussions on the role of the journalist in seeking solutions to the problems of mass media. Prerequisite: senior standing and consent of instructor.
- 479-3 Role of Advertising in our Society.** An exhaustive analysis of the literature covering such topics as: definitions and scope of advertising; advertising and the press; advertising as a social and economic force; evaluation of advertising; and advertising policies as related to the practices of specific business firms.
- 494-3 Criticism and Reviewing.** Study of the critical analysis of literature and other arts.
- 498-1 to 12 Readings.** Supervised readings. Not more than 6 hours may apply toward the master's degree. Prerequisite: consent of instructor.
- 501-3 Literature of Journalism.** Critical reading of selected books relating directly and indirectly to journalism. Lectures, reviews, and discussions comprise the course work.
- 530-2 Seminar in Press Freedom.** Observation of the comment function performed by the daily newspaper as related to current issues; role of the editorial writer, syndicated columnist, and cartoonist.
- 531-3 Seminar: Public Relations.** Problems in formulation of public relations policies. Emphasizes fact finding, determination of objectives, orientation of plans toward specific publics, execution, and evaluation. Prerequisite: 431.
- 532-4 Seminar: Mass Communication Theory.** Individual exploration of some aspect of mass communication theory. Students construct communication models of their own design and test them. Prerequisite: 433b or consent of instructor.
- 533-1 to 12 Research Problems in Journalism.** Individual work on selected problems for research. Prerequisite: graduate standing.
- 540-3 Philosophy of Journalism.** A study of journalistic ethics with emphasis on concepts of freedom and responsibility and the development of journalistic standards. Consideration of the responsibility of press in modern society.
- 545-3 Studies in Journalism History.** A critical analysis of the literature in the context of the social and intellectual history of the times.
- 590-3 Seminar in Journalism History.** Analysis of and practice in scholarly writing in the field of journalism history. Prerequisite: 545 or consent of instructor.
- 591-1 to 12 Topical Seminar in Communication.** Serves the individual needs and interests of journalism graduate students. Prerequisite: graduate standing.
- 592-3 Communication and National Development.** Examination of a wide range of functions of mass media communications in the process of national development in non-Western countries. Prerequisite: graduate standing and consent of instructor.
- 595-0 Graduate Seminar.** Discussions of matters relating to graduate study, research, departmental and university requirements. Guest lecturers will discuss their research activities and areas of general interest to journalism graduate students. Required each quarter for all journalism graduate students.
- 598-1 to 12 Readings.** Supervised readings in selected journalistic subjects. Not more than 6 hours may apply toward the master's degree. Prerequisite: consent of instructor.
- 599-1 to 8 Thesis.** Minimum of 5 hours to be counted toward a master's degree.
- 600-1 to 48 Dissertation.** Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Linguistics

- 401-8 (4,4) Introduction to Linguistics.** (a) General linguistics, fundamentals of the nature, structure, and functioning of language. (b) Structural linguistics, methods of descriptive linguistics, and analytical procedures. May be taken singly.
- 402-9 to 12 (4,4,1-4) Phonetics.** (a) Theory and practice of articulatory phonetics. (b) Theory and practice of instrumental phonetics. (c) Transcription laboratory.
- 403-4 English Phonology.** Analysis of spoken English, American, and British. Prerequisite: 401a or b, or equivalent.
- 404-4 American Dialects.** Phonemics of American English. Emphasis in the major American dialects. Prerequisite: 401b, 402a, or equivalent.
- 405-4 Structural Phonology.** Survey of phonological theory (phonemic and

distinctive feature theory); examination of various phonological systems. Prerequisite: 402a.

408-4 Introduction to Transformational Syntax. Basic concepts and formalism of transformational generative grammars. Prerequisite: 401b or consent of instructor.

410-1 to 30 (5,5,5,5,5) Uncommon Languages. (p), (q), (r) Review of structure of modern spoken Lao. Introduction to written language. Emphasis on conversational style. (s), (t), (u) Review of structure of modern spoken Cambodian. Introduction to written language. Emphasis on conversational style. Prerequisite: GSC 250p,q,r,s,t,u.

420-12 (4,4,4) Uncommon Languages. (Advanced Vietnamese.) (Same as Foreign Languages 420.) Reading of third year level materials in preparation for classes conducted in Vietnamese. Review of grammar. Prerequisite: 410 or equivalent.

430-4 to 20 (4,4,4,4,4) Grammatical Structures. Detailed analysis of the structure of particular languages. Prerequisite: 401a,b, or equivalent.

450-4 to 12 (4,4,4) Language Families. Synchronic survey of language families or sub-families. Prerequisite: 401a,b or equivalent.

501-4 Contrastive Linguistics. Comparison of the structure of English with the structure of other languages. Phonology and syntax. Prerequisite: 401b.

504-4 Dialectology. Materials and methods of dialectology and linguistic geography. Prerequisite: 402a or equivalent.

505-4 Generative Phonology. Application of generative theory to the study of phonology. Prerequisite: 405 and 408.

506-8 (4,4) Historical Linguistics. (a) Theories and methods in the study of the history and pre-history of languages and language families. (b) Application of generative-transformational theory to problems and theory in historical linguistics. Prerequisite: for 506a is 401b, for 506b is 506a.

508-4 Advanced Transformational Syntax. Application of transformational generative theory to study in depth of English syntax. Prerequisite: 408.

510-4 History of Linguistics. Classical times to the present.

530-4 to 12 Historical Grammatical Structures. History of languages or language families. Prerequisite: 506a.

540-2 to 8 Studies in Linguistics. Selected topics in theoretical and applied linguistics. Prerequisite: 401b or equivalent, or consent of instructor.

550-8 (4,4) Pro-seminar in Linguistics. Guided research in selected topics. (a) Syntax. (b) Phonology, or semantics. Prerequisite: consent of instructor.

570-3 Classroom Techniques in Teaching English as a Foreign Language. Theory and practice.

571-3 Language Laboratories. The theory and practice of the language laboratory in foreign language pedagogy.

572-3 Preparation of Teaching Materials in English as a Foreign Language. Theory and practice in development of EFL texts. Prerequisite: 570, or consent of instructor.

573-3 Practicum in EFL Materials Development. Prerequisite: 572.

580-4 Seminar in Special Problems of English as a Foreign Language. Prerequisite: 570, 571, 572, or 573.

581-6 (2,2,2) Methods Practicum in English as a Foreign Language. Class observation and supervised practice teaching in English as a foreign language, meets concurrently with Linguistics 100. Prerequisite: 571.

585-2 Teaching College Composition to Foreign Students. Objectives, methods, and materials for English 105 and similar courses. Observation and practice under supervision. Required for teaching assistants in linguistics.

596-4 Stylistics. (See English 596.)

597-2 to 12 Readings in Linguistics. Individual readings in linguistics under guidance. Prerequisite: 401b or equivalent.

599-2 to 9 Thesis. Minimum of 5 hours to be counted towards a master's degree.

Management

431-4 Organizational Behavior II. A study of classical and modern theories concerning complex organizations. Particular emphasis on processes and issues of dividing work, achieving coordination, and organizational change and adaptation. Prerequisite: 341, or consent of instructor.

440-4 The Management Process. Analysis of management theories and the

administrative process. Specific managerial activities are analyzed and discussed. Functional relationships in administered organizations are explored. Restricted to graduate students who have not taken 340 or equivalent.

452-4 Business Operations Analysis. Analysis of business operations and management problems emphasizing problem formulation, performance measures, decision criteria and various mathematical models and their application; linear programming, game theory. Prerequisite: 340; Mathematics 140a, or equivalent; GSD 110 or equivalent; or consent of instructor.

456-4 Management Information Systems. Organizational activities and informational requirements of management viewed as systems modeled for systematic investigation leading to effective management and decision making. Representative management systems studied, charted, and manipulated. Prerequisite: 340, 345, 452.

460-4 Work Measurement For Wage and Salary Control. Research design and methodology for wage and salary administration in an organization; fundamental considerations in evaluating jobs and positions; compensation methods and wage incentive systems. Prerequisite: 385.

474-4 Management Responsibility in Society. Analysis of the political, social, and economic environments in which the manager must function and the manner in which the executive has both adapted to and influenced his environment. Prerequisite: 340, senior standing, or consent of instructor.

479-4 Problems in Business and Economics. (Same as Economics 479.) Applications of economic theory and tools of analysis to practical business problems. Cost and demand functions are analyzed from a policy standpoint. Prerequisite: 340; Economics 215, 308, or equivalent; Marketing 301 or equivalent; senior standing; or consent of instructor.

480-4 Recent Problems in Labor Law. Social, economic, and legal evaluation of recent labor problems, court decisions, and legislation. Concern is on long-run legislative impact on manpower planning, dispute settlement, and utilization of employment resources. Prerequisite: 385 or consent of instructor.

481-4 Administrative Policy. Integration and analytical application of business core courses to comprehensive business cases. Emphasis on policy issues in the identification and resolution of business problems. Methods of providing simulated experience such as business gaming will be used where appropriate. Prerequisite: 340, Finance 320, Marketing 301, or equivalent.

483-4 Advanced Production Management. Internal problems of managerial control of production including recent developments in theory and techniques: case material will be utilized for the development of analytical ability. Prerequisite: 380.

485-4 Problems in Personnel Management. Analysis of problems in personnel administration arising from the current developments in organization. Included are case problems, special reports, and personnel practices. Prerequisite: 361, 385.

499-1 to 8 Special Topics in Management. Utilizes special faculty resources. Prerequisite: 16 hours in business and consent of chairman.

Marketing

401-4 Problems of Retailing. Emphasis application of managerial marketing concepts to the solution of typical retailing problems. Prepared retail management cases are analyzed along with individual reports on current retailing problems. Prerequisite: 363.

438-4 Sales Management. Developing and training a sales force. The different types of sales forces. Managing sales functions: determining salesmen's territories, quotas, compensation. Budget preparation. Development and implementing the merchandise plan. Prerequisite: 363.

439-4 Industrial Marketing Management. Designed to give an over-all view of the field of Industrial Marketing. Additional emphasis to be placed on decision criteria. Prerequisite: 363.

450-4 Introduction to Managerial Marketing. Designed to give an over-all view of the field of marketing and the field of marketing policy decisions. Cases are used to illustrate theory covered. Prerequisite: Restricted to graduate students.

452-4 Physical Distribution Management. Integration of physical distribution activities of the firm into a system. Transportation and location as elements

of the system. Inventories and service as constraints upon the system. Planning, operation, organization, and management of the system. Prerequisite: 301, Economics 215.

463-4 Advertising Management. A study of advertising from the viewpoint of business management. Problems of integrating advertising into marketing programs and related advertising issues are emphasized. Prerequisite: 363 and 390.

493-4 Marketing Policies. A comprehensive and integrative view of marketing policy formulation. Marketing decisions analyzed and discussed. Prerequisite: 363, 390, accounting 261, and 4 additional hours in marketing, and senior standing.

499-4 Undergraduate Seminar in Marketing. Aspects and issues in the field of marketing. Seniors of high academic standing only. Prerequisite: by invitation, 16 hours of marketing.

Mathematics

400-3 History of Mathematics. An introduction to the development of major mathematical concepts. Particular attention given to the evolution of the abstract concept of space, to the evolution of abstract algebra, to the evolution of the function concept, and to the changes in the concept of rigor in mathematics from 600 B.C. Prerequisite: 301 or consent of instructor.

401-3 Set Theory. Ordinal numbers, transfinite induction, cardinal numbers and their arithmetic properties, Cantor theorem, Schroeder-Berstein theorem, the axiom of choice and its equivalent forms, the continuum hypothesis. Prerequisite: 301 or consent of instructor.

410-16 (4,4,4,4) Statistical Analysis. For students in fields using statistical methods but who are not required to take calculus. Includes (a) elements of probability, estimation, and testing hypotheses; (b) the general linear model (multiple linear regression, analysis of variance, analysis of covariance) and nonparametric statistics; (c) design of experiments; (d) sample survey techniques. May not be used to satisfy requirements for a mathematics concentration. Three lectures and 2 laboratory hours per week. Must be taken in either a,b,c,d or a,b,d,c sequence. Prerequisite: 111b or consent of instructor.

415-2 to 4 Improvement of Instruction in Arithmetic in the Elementary School. Grade placement of content, newer instructional practices and materials of instruction, and means of evaluating achievement. Prerequisite: 310 or consent of instructor.

419-6 (3,3) Algebraic Structures. A study of the properties of such basic algebraic structures as groups, rings, fields. Must be taken in a,b sequence. Prerequisite: 301 or consent of department.

421-6 (3,3) Linear Algebra. The theory of determinants and systems of linear equations; vector spaces, linear independence, bases, dimension; linear transformations, change of base, similarity; quadratic and Hermitian forms, orthogonal, and unitary transformations; triangular and diagonal form; eigenvalues and eigenvectors; normal matrices; nilpotent and idempotent matrices, the spectral theorem. Must be taken in a,b sequence. Prerequisite: 252b, 301, or consent of department.

425-3 Theory of Numbers. Selected topics from number theory. Prerequisite: 325 or consent of instructor.

426-6 (3,3) Introduction to Mathematical Logic. A formal development of the classical propositional calculus and functional calculi of first and second order from the primitive basis. Consistency and completeness. Validity and satisfiability. Must be taken in a,b sequence. Prerequisite: 301 or consent of department.

428-3 Discrete Structures. (Same as Computer Science 442.) Review of sets, functions, and relations. Algebraic structures including semi-groups, groups, and Boolean algebras. Subalgebras, congruence relations, homomorphisms, and direct products. Elements of graph theory. Applications to various areas of computer science. Prerequisite: 301.

429-3. Applied Boolean Algebra. (Same as Computer Science 445.) Application to switching circuits and propositional logic. Circuit simplifications, logical circuits, and sequential circuits. Prerequisite: 428 or Computer Science 442.

430-4 Projective Geometry. Introduction to the fundamental concepts of projective geometry. Topics usually include the study of conics, polar systems

of conics, homogeneous coordinates, cross-ratio, harmonic sets, duality, projectivities, and involutions. Prerequisite: 252a, 301, or consent of instructor.
433-6 (3,3) Introduction to Topology. Topological spaces, continuity and homeomorphisms, construction of topologies, separation, compactness, connectedness, completeness. Must be taken in a,b sequence. Prerequisite: 301 or consent of department.

440-2 to 4¹ Modern Algebra for Teachers. An introduction to algebra as a logical system, including groups, rings, and fields. Prerequisite: consent of instructor.

442-2 to 4¹ Survey of Geometry. A survey of geometry, including projective geometry, topology, etc. Prerequisite: consent of instructor.

451-3 Introduction to the Theory of Computation. (See Computer Science 451.) Prerequisite: 428 and either 429 or consent of instructor.

452-9 (3,3,3) Advanced Calculus. Fundamental concepts of analysis: limits, continuity, differentiation, and integration. Major topics include partial differentiation, vector analysis, Riemann-Stieltjes integrals, multiple integrals, infinite series, improper integrals, uniform convergence, Fourier series, and line integrals and surface integrals. Must be taken in a,b,c sequence. Prerequisite: 252b.

455-9 (3,3,3) Advanced Mathematics for the Physical Sciences. (a) Theory of functions of complex variable, analytic functions, contour integration, and conformal mapping. (b) Ordinary differential equations: existence and uniqueness for initial value and boundary value problems, oscillation, stability. (c) Introduction to vector fields, line integrals, divergence and curl, integral theorems, the one-dimensional wave and heat equations, and separation of variables technique. May be taken individually or in any sequence. Prerequisite: 252b to 455a; 305b to 455b,c; or consent of instructor.

460-4 Modern Geometry. Advanced topics in Euclidean geometry by the synthetic method. Topics include the nine-point circle, Simson line, theorems of Ceva and Menelaus, coaxal circles, harmonic section, poles and polars, similitude, and inversion. Prerequisite: 20 hours of college mathematics.

472-3 Introduction to Mathematical Programming. (Same as Computer Science 472.) Theory of linear programming, game theory, and dynamic programming. Prerequisite: 421a.

475-6 (3,3) Numerical Analysis I. (Same as Computer Science 464.) Theory and practice of computation. Emphasis on methods useful with high speed digital computers. Includes the solution of non-linear equations, interpolation and approximation, numerical differentiation and integration, differential equations, matrix calculations, and the solution of systems of linear equations. No credit for both 475 and Computer Science 461. Must be taken in a,b sequence. Prerequisite: 221 or 421a and 305a and Computer Science 202.

480-9 (3,3,3) Probability. Introduction to probability theory. Includes the algebra of probabilities; discrete and continuous distributions, limit theorems, generating functions, and some elements of stochastic processes. Must be taken in a,b,c sequence. Prerequisite: 252b.

483-9 (3,3,3) Introduction to Mathematical Statistics. A mathematical development of the elements of statistical theory. (a) Probability distributions, generating functions, and limit theorems. (b) Statistical inference: estimation, tests of hypotheses, general linear hypothesis. (c) Design of experiments—a mathematical model approach. Must be taken in a,b,c sequence with the exception that 480a, 421a, and consent of instructor may replace 483a. A student will not be allowed university credit for both 480a and 483a. Prerequisite: 252b.

495-1 to 10 Special Topics in Mathematics. Individual study or small group discussions in special areas of interest under the direction of a member of the faculty. Prerequisite: consent of chairman and instructor.

501-9 (3,3,3) Real Analysis. Basic set theory including the theory of ordinal numbers. Real number system, topology of the real line. Continuous and semicontinuous functions, limits. Classical L^p spaces. Metric spaces: topology, continuous functions, convergence, Baire category. Banach spaces, Hilbert spaces. General measure and integration theory. Must be taken in a,b,c sequence. Prerequisite: 452c.

502-3 to 18 Advanced Topics in Ordinary Differential Equations. Selected topics from special areas in the theory of ordinary differential equations. Prerequisite: consent of instructor.

505-9 (3,3,3) Theory of Ordinary Differential Equations. Existence and uniqueness theorems; general properties of solutions; linear systems; geometric

theory of nonlinear equations; stability and control theory; self-adjoint boundary problems; oscillation theorems. Must be taken in a,b,c sequence. Prerequisite: 501b and 421a or consent of instructor.

507-9 (3,3,3) Partial Differential Equations. Classification of partial differential equations; separation of variables; elementary solutions of the heat and wave equations; potential theory; n-dimensional parabolic operators. Must be taken in a,b,c sequence. Prerequisite: 452c.

510-9 (3,3,3) Mathematical Logic. Incompleteness and undecidability results of Godel, Church, and Tarski (together with the necessary recursion theory). Topics from the theory of definability, model theory, proof theory, consistency of arithmetics. Must be taken in a,b,c sequence. Prerequisite: 426b or consent of instructor.

512-3 to 18. Advanced Topics in Mathematical Logic. Incompleteness and undecidability results, including the necessary recursion theory; definability theorems; model theory; consistency of arithmetic. Prerequisite: 426b or consent of instructor.

520-9 (3,3,3) Modern Algebra. Topics from group theory, ring theory, and field theory; including Sylow theorems, solvable groups, nilpotent groups, rings with descending and ascending chain conditions, elementary divisor theorem for R-modulus, Galois theory, and cyclotomy. Must be taken a,b,c sequence. Prerequisite: 419 or consent of instructor.

522-3 to 18 Advanced Topics in Algebra. Group representations, homological algebra, algebraic geometry, algebraic numbers. Prerequisite: 520b.

525-3 to 18. Advanced Topics in Number Theory. Emphasizes analytic methods; as analytic prime number theory; Dirichlet's theorem on primes in arithmetical progressions; Diophantine approximations; and geometry of numbers. Prerequisite: consent of instructor.

527-3 Formal Languages. (Same as Computer Science 554.) Includes regular, context-free, context-sensitive and type O (phrase structure) grammars. Normal forms, restricted grammars, Post productions. The relation between grammars and abstract machines. Decision problems of formal languages. Prerequisite: Computer Science 451.

528-3 Automata Theory. (Same as Computer Science 551). Finite automata, decision problems, regular sets, derivatives and star heights of regular expressions. Algebraic analysis of automata with emphasis on semigroup and decomposition theory. Probabilistic automata. Prerequisite: Computer Science 451.

529-3 Theory of Computability. (Same as Computer Science 557). Turing machines and recursive functions. Church's thesis. Solvable and unsolvable problems including the halting problem. Recursively enumerable sets. Complexity classification. Prerequisite: Computer Science 451 or consent of instructor.

530-9 (3,3,3) General Topology. Topological spaces; denseness, category; open, closed sets, Borel sets; separation axioms; subspaces; continuity; lattice of topologies; countability axioms; connectedness, compactness, local properties; regularity to complete normality. Hilbert space, metrizable spaces; extension theorems; well-ordering; product spaces. Must be taken in a,b,c sequence. Prerequisite: 433b or consent of instructor.

531-9 (3,3,3) Algebraic Topology. Homology and cohomology of complexes; axiomatic homology and cohomology. Homotopy theory; covering spaces. Cohomology of sheaves; applications in analysis; DeRahm cohomology; Poincaré duality. Must be taken in a,b,c sequence. Prerequisite: 433b, 419b.

532-3 to 18 Advanced Topics in Topology. Topological groups, topological dynamics, uniform spaces, homotopy theory, fiber spaces, and others. Prerequisite: 530b.

536-3 Differential Geometry. Curvature, torsion, the Frenet formulas, and intrinsic equations of curves in three-dimensional Euclidean space; applications to kinematics. Curves on a surface; first and second fundamental forms; normal sections and Meusnier's theorem; mean and total curvature. Prerequisite: 452c.

543-4¹ Probability for Teachers. An introduction to the basic concepts of probability theory. Major topics include algebra of events, probabilities in a finite sample space, conditional probabilities and stochastic independence, random variables and their distribution, mathematical expectation, standard

¹ These courses are open to candidates for the Master of Science in Education degree in mathematics, to National Science Foundation Institute participants, and to those who have received the consent of the chairman of mathematics or the director of the institute.

deviation, covariance, special distributions. This course is open to candidates for the Master of Science in Education degree in mathematics, to National Science Foundation Institute participants, and to those who have received the consent of the chairman of the Department of Mathematics or the director of the Institute.

545-4¹ Intermediate Analysis for High School Teachers. A rigorous development of differentiation and integration of continuous real functions. Topics include sequences, series, limits, real continuous functions, integrable functions on a closed interval. Prerequisite: consent of instructor.

548-2 to 4¹ Trends in School Mathematics. For secondary school mathematics teachers dealing with current developments in mathematics instruction at the elementary and secondary levels. Prerequisite: consent of department.

550-1 to 10 Seminar. Supervised study and preparation of reports on assigned topics. Reports presented for class discussion. (a) Algebra. (b) Geometry. (c) Analysis. (d) Probability and Statistics. (e) Mathematics Education. (f) Logic and Foundations. (g) Topology. (h) Applied Mathematics. (i) Differential Equations. (j) Number Theory. Prerequisite: consent of instructor.

551-9 (3,3,3) Functional Analysis. The theory of linear transformations between infinitely dimensional topological vector spaces, including Banach and Hilbert spaces, with various applications. The basic notion for the study is that of a functional or continuous scalar-valued linear transformation. Must be taken in a,b,c sequence. Prerequisites: 501c and 421b.

552-3 to 18 Advanced Topics in Analysis. Abstract harmonic analysis, uniform asymptotic distribution model of sequence, several complex variables, summability methods. Riemann surfaces. Prerequisite: 501c.

555-9 (3,3,3) Complex Variables. Classical and modern analytic function theory, including Cauchy-Riemann equations, Cauchy-Goursat theorem, conformal mapping, normal families, Riemann surfaces, entire functions. Must be taken in a,b,c sequence. Prerequisite: 452c.

560-6 (3,3) Calculus of Variations. An introduction to the basic concepts and techniques of the calculus of variations including the classical necessary conditions for an extremum of a functional, general end point conditions, the second variation, fields, sufficiency conditions, and applications. Must be taken in a,b sequence. Prerequisite: 452c.

572-6 (3,3) Numerical Analysis II. (Same as Computer Science 564.) Mathematical and computer-oriented treatment of numerical problems in linear algebra and the solution of ordinary and partial differential equations, integral equations, and boundary value problems. Prerequisite: consent of instructor.

580-9 (3,3,3) Mathematical Methods of Statistics. A presentation of probability and statistical inference based on an axiomatic and employing advanced mathematical concepts. Topics include the theory of measure and integration in \mathbb{R}^n , foundations of probability, random variables and distributions in \mathbb{R}^n , sampling distributions, tests of hypotheses, theory of estimation. Must be taken in a,b,c sequence. Prerequisite: 452c.

581-9 (3,3,3) Advanced Probability Theory. Background in modern probability theory. Measure-theoretic foundations; convergence theorems; additional selected topics. Prerequisite: 501c or consent of instructor.

592-2 to 4¹ Research in Mathematics Education. Critical study of research papers in the field of secondary mathematics education. Training in research and writing techniques as they pertain to the secondary mathematics program. Prerequisite: consent of chairman.

595-1 to 10 Special Project. An individual project, including a written report. (a) in algebra; (b) in geometry; (c) in analysis; (d) in probability and statistics; (e) in mathematics education; (f) in logic and foundations; (g) in topology; (h) in applied mathematics; (i) in differential equations; (j) in number theory. Graded S/U only. Prerequisite: consent of instructor.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward the Master of Arts degree.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

¹ These courses are open to candidates for the Master of Science in Education degree in mathematics, to National Science Foundation Institute participants, and to those who have received the consent of the chairman of mathematics or the director of the institute.

Microbiology

401-1 Undergraduate Seminar. Prerequisite: senior standing and consent of instructor.

403-5 Medical Bacteriology Lecture. A general survey of the mechanisms of infection, epidemiology, and immunity and the specific application of these principles to the symptomatology, diagnosis, treatment, and control of the more common bacterial infections of man. Prerequisite: 302.

404-2 Medical Bacteriology Laboratory. Procedures for the collection and handling of medical specimens for microbial examination and for cultivation and identification of the pathogenic organisms by their morphological, biochemical, and serological characteristics. Five hours laboratory. Prerequisite: or corequisite 403.

421-3 Microbiology of Foods Lecture. The relationships of micro-organisms to the preparation and preservation of foods with consideration of the laws governing sanitation, chemical preservatives, and fair dealing of the food producer. Three hours lecture. Prerequisite: 301.

422-2 Microbiology of Foods Laboratory. Methods for preservation, sanitary inspection, and microbiological examination of foods. Four hours laboratory. Prerequisite: or corequisite 421.

423-3 Industrial Fermentation. The application of the chemical activities of microorganisms to the industrial production of beverages, foods, antibiotics, and various commercial chemical products. Prerequisite: 301 and organic chemistry.

425-6 (3,3) Biochemistry and Physiology of Microorganisms. Lecture. The chemical basis of physiological functions in microbial cells. Prerequisites: 301 and organic chemistry.

426-6 (3,3) Biochemistry and Physiology of Microorganisms. Laboratory. Prerequisite or corequisite: 425.

441-3 Virology Lecture. General properties; classification and multiplication of bacterial and animal viruses; lysogeny; immunological and serological reactions; relation of viruses to cancer; and consideration of selected viral diseases of animals. Four hours lecture. Prerequisite: 302.

442-3 Virology Laboratory. Tissue culture methods, multiplication and assay of animal and bacterial viruses, purification, electron microscopy, interference, immunity. Six hours laboratory. Prerequisite: or corequisite 441.

451-3 Immunology Lecture. Antigens, antibodies, and antigenantibody reactions in vitro and in vivo, natural and acquired immunity. Four hours lecture. Prerequisite: 302.

452-3 Immunology Laboratory. Natural defense mechanisms and immune response, preparation of antigens and antibodies, serologic reactions, conjugated antibodies, electrophoresis, anaphylaxis. Six hours laboratory. Prerequisite: or corequisite 451 and senior or graduate standing.

460-3 Genetics of Bacteria and Viruses Lecture. Genetic mechanisms, mutation, transformation, recombination, transduction, lysogeny, phenotypic mixing, and reactivation phenomena. Three hours lecture. Prerequisite: 302.

461-3 Genetics of Bacteria and the Viruses Laboratory. Genetic mechanisms, mutation, transformation, recombination, transduction, lysogeny, phenotypic mixing, and reactivation phenomena. 6 hours laboratory. Prerequisite: or corequisite 460.

462-3 Fungal Genetics Lecture. Mendelian and molecular genetics of neurospora and yeast. Mutant induction, sexual crosses, tetrad analysis, linkage, and mapping. Prerequisite: Biology 305.

463-3 Fungal Genetics Laboratory. Six hours laboratory. Prerequisite: or corequisite 462 and consent of instructor.

500-1 Seminar. Prerequisite: consent of instructor.

502-4 Evolution of Genetic Thought. Critical examination of the development of genetic thought. Prerequisite: Biology 305 or equivalent.

503-2 Cytology of Microorganisms. Problems involved in the behavior of chromosomes at meiosis with special consideration of genetical data. 2 hours lecture.

504-5 Methods of Microbiological Research. The recognition and plan of attack upon unsolved problems in microbiology. 3 hours lecture and 4 hours laboratory.

511-1 to 15 Research. Prerequisite: consent of instructor.

525-3 Biochemistry and Physiology of Microorganisms. A continuation of 425. 3 hours lecture.

526-3 Biochemistry and Physiology of Microorganisms. A continuation of 426. 4 hours laboratory. Prerequisite: 426.

528-1 to 10 Readings in Microbiology. Supervised readings for qualified graduate students. Prerequisite: consent of instructor.

541-6 Advanced Virology. Interactions between bacterial and animal viruses and their host cells; sequential synthesis of macromolecular components of viruses; synthesis of interferon; experimental carcinogenesis; genetic recombination among viruses. 3 hours lecture, 6 hours laboratory. Prerequisite: 441.

542-3 Molecular Virology. Interaction at the molecular level between tumorigenic and nontumorigenic DNA and RNA viruses and host cells, biochemical analysis of the growth cycle, uncoating, synthesis of virus-specified messenger RNA, enzymes and structural proteins, replication of viral nucleic acid, and maturation. 3 hours lecture. Prerequisite: 541.

543-3 Molecular Virology Laboratory. Characterization of viruses and their constituents; physiochemical properties; synthesis of nucleic acids and proteins; induction of release of viruses from transformed cells; differentiation of sources of viral components; studies of various species of nucleic acids by such methods as sedimentation velocity, ultracentrifugation, pulse and pulse chase experiments, and polyacrylamide gel electrophoresis. Prerequisite: 541.

562-3 Molecular Genetics. Fundamentals including discussions of current research on replication, transcription, translation, mutation, suppression, repression, and their interaction and interdependence. Prerequisite: 425.

599-3 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree. Prerequisite: consent of instructor.

600-3 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree. Prerequisite: consent of instructor.

Music

405-3 Seminar in Instrumental Music Education. Advanced problems of administration and supervision of public school instrumental music programs, selection of appropriate materials for study and development, rehearsal techniques, preparation and techniques for performances of all types. Prerequisite: 305I.

409-2 Band Arranging. Advanced methods and techniques in arranging for the concert and marching bands from public school to collegiate level. Includes methods of transcribing from orchestral, organ, and piano literature. Prerequisite: 309a or equivalent.

411-9 (3,3,3) Music Literature. (a) Symphonic: A study of the development of the symphony and the symphonic poem. (b) Choral: The literature of the larger vocal forms such as the cantata and oratorio. (c) Chamber Music: Study of chamber music from the Renaissance to the present.

414-2 to 6 Collegium Musicum. Practicum in the preparation and performance of music from early times to the classical period. Prerequisite: Music major and/or consent of the department.

420-1 to 3 Music Education Practicum. A shop-laboratory course dealing with the selection, adjustments, maintenance, and repair of musical instruments. Prerequisite: consent of instructor.

430-2 Stage Band Arranging. The study and analysis of jazz harmony, melody, and rhythm as applied to modern instrumentation. Workshop wherein arrangements are written and played. Prerequisite: 309a.

431-2 Organization and Development of the High School Stage Band. The relationship of the stage band to the overall music program; instrumentation; sources of music; types of presentations; rehearsal techniques; study of the effective application of dynamics, phrasing, intonation, and balance for improved performance. Prerequisite: 430.

440-1 to 4 Private Applied Music.

a. Violin

b. Viola

c. Violoncello

d. String Bass

e. Flute

f. Oboe

g. Clarinet

h. Bassoon

i. Saxophone

j. Percussion

k. Piano

l. French Horn

m. Trumpet

n. Trombone

o. Tuba

p. Baritone

q. Voice

r. Organ

s. Harpsichord

Applied music for graduate credit is offered at the 400 and 500 levels in the

areas listed above. Credit is given at 1 to 4 hours per quarter on each level. May be repeated each quarter of graduate study. Students with majors in performance usually take 4 hours per quarter at the 500 level; majors in music education and all minors usually take 2 hours at the 400 level. Prerequisite for 440 and 540: audition or consent of instructor.

441-6 (2,2,2) Counterpoint. (a) 16th Century Counterpoint. Species counterpoint and creative writing in the style of Palestrina and his contemporaries. Prerequisite: 205c or consent of instructor. (b) 18th Century Counterpoint. Analysis and creative writing in the contrapuntal-harmonic technique of Bach and his contemporaries. Prerequisite: 205c or consent of instructor. (c) Canon and Fugue. Analysis and creative writing of the larger imitative forms. Prerequisite: 441b.

444-2 to 6 Intermediate Composition. Required of undergraduates with concentration in theory-composition, culminating with original works in contemporary idioms. Taught by individual instruction. Prerequisites: 312c and consent of department.

447-6 (3,3) Electronic Music. (a) Introduction to classical studio equipment and techniques; use of voltage controlled equipment. Individual laboratory experience available. (b) Emphasis on creative projects, more sophisticated sound experimentation and analysis. Enrollment limited. Prerequisite: 499, or GSA 361, or consent of instructor.

451-3 Teaching of General Music, Secondary School.

453-2 to 6 Choral Materials and Techniques. Demonstration and performance of choral rehearsal procedures; developing tone, diction, blend, and balance; concert production; performance of selected choral materials appropriate for junior and senior high school. Prerequisite: consent of instructor.

454-2 to 6 Instrumental Materials and Techniques. Demonstration and performance of instrumental music rehearsal procedures; developing tone, articulation, blend, and balance; concert production; performance of selected choral materials appropriate for junior and senior high school. Prerequisite: consent of instructor.

455-2 to 6 Elementary Music Education Workshop.

456-6 (3,3) Music for Exceptional Children. (a) Theories, applications, and techniques for therapeutic and recreational use of music with physically and mentally handicapped children. Includes keyboard, autoharp, guitar, and tuned and untuned classroom instruments. (b) Applications for the gifted, emotionally disturbed, and culturally disadvantaged child. Must be taken in a,b sequence. Prerequisite: 302a or consent.

460-3 Teaching Music Appreciation. Principles and methods for secondary schools and colleges; theories upon which various methods and principles are based.

461-2 Teaching Techniques and Materials for the Beginning and Intermediate Levels. Designed to meet the needs of applied students in which the problems of private studio teaching and college level teaching are discussed.

462-2 Teaching Techniques and Materials for the Advanced Student. Designed to meet the needs of applied students in which the problems of private studio teaching and college level teaching are discussed. (Continuation of Music 461.)

468-2 to 12 Music Productions. Study of the techniques involved in staging operas and musicals.

471-6 (3,3) Ethnomusicology. (Same as Anthropology 471.) A survey of theory, method, and form in ethnomusicology, with concentration on selected geographical areas. (a) Oceania, Asia, and Africa. (c) Middle East, Europe, and the New World.

481-1 to 6 Readings in Music Theory.

482-1 to 6 Readings in Music History and Literature.

483-1 to 6 Readings in Music Education.

499-1 to 12 Independent Study. The capable student engages in original investigations with faculty specialists. May be repeated for credit. Prerequisite: consent of instructor.

501-3 Introduction to Graduate Study in Music. Basic bibliographical and historical research techniques in music theory, literature, and education.

502-6 (2,2,2) Analytic Techniques. Analysis of representative works chosen from the Baroque, Classical, Romantic, and Modern eras.

503-3 to 4 Objective Research Techniques in Music Education. Theory, techniques, and procedures of evaluating music aptitude and achievement; survey of current research investigations in music education. A minor original research project is required.

- 504-6 (3,3) **Medieval and Renaissance Music.** (a) Medieval. (b) Renaissance.
- 505-3 **Music of the Baroque Period.** Opera, oratorio, cantata, and instrumental music in the period 1600 to 1750; the development of vocal and instrumental forms culminating in the works of Bach and Handel.
- 506-3 **Music of the Classical Period.** Development of opera, the symphony, the sonata, and chamber music in the 18th and early 19th century with particular emphasis on Haydn, Mozart and Beethoven.
- 507-3 **Music of the Romantic and Impressionistic Periods.** Development of opera, the symphony, the symphonic poem, the sonata, and chamber music in the 19th and early 20th centuries. Rise of nationalism, impressionism.
- 508-3 **Music of the Twentieth Century.** The heritage of 20th century music; study and analysis of musical philosophies of contemporary composers.
- 509-3 **The History and Philosophy of Music Education.** A study of the historical and philosophical evolution of music education and the identification of current forces, issues and trends influencing the profession.
- 512-3 **History of Opera.** The development of opera as a form, with a detailed study of operas since 1600.
- 515-3 **20th Century Literature.** A survey of contemporary music in Russia, Western Europe, and the Americas in its relation to sociology, political, and cultural developments.
- 518-3 **Pedagogy of Music Literature.** Principles of teaching music literature and music appreciation courses at the college level.
- 522-3 **Seminar: Music History and Literature.** Advanced study in special periods of music history-literature.
- 531-2 to 9 **Advanced Composition.** Composition in the larger forms for solo and ensemble performance. Prerequisites: 312c, 342c, and consent of instructor. Required of all theory-composition majors 3 hours per quarter; elective credit for majors in other areas. Prerequisite: 444c and consent of instructor.
- 535-3 **Contemporary Idioms.** Techniques of composition developed during the 20th century by composers of Europe and America.
- 540-1 to 4 **Private Applied Music.** (See Music 440).
- 545-3 to 9 **Pedagogy of Music Theory.** An orientation of the philosophies of theory to the problems of pedagogy. Required of all theory-composition majors.
- 546-3 **Musical Aesthetics.** Nature and significance of music in the life of man. Critical theory in the writings of philosophers of music and art from Plato through Dewey and Cage.
- 550-3 **Administration and Supervision of Music.**
- 556-2 to 6 **Advanced Conducting.** Problems in score reading and interpretation. Laboratory conducting of larger ensembles.
- 560-2 to 3 **Seminar in Music Education.** Trends, current practices, philosophies of music education.
- 566-1 to 12 **Instrumental Ensemble.**
- 567-1 to 12 **Vocal Ensemble.**
- 568-2 to 12 **Opera Workshop.** An intensive course in opera for voice majors, including the study and public performances of scenes and entire operas.
- 598-6 **Graduate Recital.**
- 599-3 to 9 **Thesis.**

Occupational Education

- 419-4 to 16 **Student Teaching in Occupational Programs.** Experience in working with special and post-high school technical training programs in approved centers. The student teacher will follow the program of the supervisors of the primary specialization in both regular and extra-class activities. Prerequisite: 9 hours professional courses.
- 420-8 (4,4) **Enterprise: The Man-Machine System.** Classroom, laboratory, and library study of man-machine systems in a variety of industries and institutions, with emphasis on teaching children and youth to understand the world of work. For advanced students and experienced teachers. Must be taken in a,b sequence. Prerequisite: 20 hrs. in Technical and Industrial Education.
- 421-4 **Principles of Enterprise Teaching.** Problems and special methods of teaching in enterprise education programs. Prerequisite: 16 hours technical and industrial education courses.

425-2 to 12 Practicum. Applications of occupational skills and knowledge. Co-operative arrangements with corporations and professional agencies provide opportunity to study under specialists. Prerequisite: 20 hours in specialty.

430-2 to 8 Special Problems. Special opportunity to obtain assistance and guidance in the investigation and solution of occupational education problems. Prerequisite: consent of instructor and coordinator.

435-6 to 18 Manual Arts Internship. Supervised hospital experience featuring various applications of manual arts therapeutical treatments. Prerequisite: consent of coordinator.

450-2 to 12 Advanced Occupational Skills and Knowledges. Modern occupational practice in selected fields. For experienced professionals seeking advanced techniques in specialized areas of occupational education. Prerequisite: Intermediate level study in the specialty.

465-8 (4,4) Industrial Safety. (a) Principles of industrial accident prevention; accident statistics and costs; appraising safety performances; industrial hazards and safeguards; fire control. (b) Effective industrial safety organizations, management and supervision; safety psychology and training programs; health safeguards; occupational diseases and other industrial hazards. Prerequisite: senior standing.

480-3 Curriculum Development in Industrial Arts Education. Selection, development, and analysis of new concepts in technology, man, and enterprise for use in the schools. New methodology and apparatus for teaching are developed. For advanced students and experienced teachers. Prerequisite: 20 hrs. in TIED.

485-3 Principles and Philosophy of Vocational and Technical Education. (Same as Agricultural Industries 485, Home Economics Education 485, Secondary Education 485, and Secretarial and Business Education 485.) Team teaching used. Nature and purposes of practical arts, vocational and technical education, their relationships and differences, and the place of each in preparing people for the world of work. Prerequisite: student teaching or consent of department.

488-3 Analysis for Occupational Education. Fundamentals of analyzing occupations and careers for establishing units of instruction for occupational education courses. Required for occupational teachers, coordinators, and supervisors. Prerequisite: 12 hours in teaching specialty.

489-3 Organization of Subject Matter. Course and unit construction, preparation of materials for distribution to students, preparation of teacher-made tests, course evaluation and updating. Prerequisite: 488.

490-3 Principles of Occupational Teaching. Methods of teaching in occupational education programs. Required for occupational teachers, coordinators, and supervisors. Prerequisite: 12 hours in teaching specialty.

493-3 Audio-Visual Media for Occupational Education. Selection, development, analysis, and use of commercial and self-made software systems.

500-8 (4,4) Legislation, Organization, and Administration of Occupational Education. (a) Historical and contemporary thought and practice re federal and state legislation for occupational education in sundry institutions. Legislators are used as resource persons. Required for supervisors. (b) Policies governing the organization and administration of programs in states and local agencies. Students write a proposal for a new program. Must be taken in a,b sequence.

502-4 Evaluation of Occupational Education Programs. Criteria and instrument development, testing techniques, and appraisals. Special emphasis given to the principles and methods of evaluation of progress in laboratory and shop subjects of a practical arts nature. Experience in development and construction of pertinent and effective evaluative devices. Prerequisite: one course in tests and measurement.

505-4 Administration and Supervision of Occupational Education. Principles, practices, and techniques relating to supervising and administering local programs. Required for vocational coordinators and supervisors.

506-4 Cooperative Programs. Problems and procedures involved in setting up and operating cooperative work-study programs. Required for vocational coordinators.

510-4 Planning Occupational Education Facilities. Principles and practices of planning classrooms and laboratories for occupational education programs. How to work with administrators, staff, and paid professionals to assure judicious location and design of facilities.

525-4 Cooperative Vocational-Technical Education. (Same as Agricultural

Education 525, Home Economics Education 525, and Secretarial and Business Education 525.) Team teaching used. Interrelated cooperative programs as they are developed in America, and especially Illinois, are presented. Coordinators' duties and responsibilities along with the operation of interrelated vocational cooperative programs are featured. Prerequisite: student teaching.

540-4 Research in Occupational Education. Basic research methods and techniques in the design, investigation, and reporting of research studies relating to occupational education.

541-4 Occupational Information and Guidance. Designed for school counselors, industrial supervisors, and teachers to give them orientation to and experience with occupational information and vocational adjustment.

550-4 College Teaching of Occupational Education. Problems of college students and their adjustments to occupational subject matter. Organization and utilization of laboratories and instructional systems. Professional contributions of college teachers.

560-2 to 12 New Developments in Occupational Education. Recent developments and trends in occupational education, presented by recognized authorities for discussion and review.

570-2 to 6 Special Investigations. (Same as Applied Science 570.)

580-1 to 9 Seminar. (Same as Applied Science 580.)

599-1 to 9. Thesis.

Philosophy

400-4 Contemporary Mind. Analysis of thought-patterns and motivations dominating the American mind during the present decade of the 20th century.

406-4 Philosophy of Biology. Leading concepts of biological sciences: species, evolution, life, organism and part, etc. Abstract ideas of biology are related, wherever possible, to specific experiments recorded in scientific literature. Prerequisites: 300 or 320, and three laboratory or field courses in the biological sciences or consent of instructor.

415-3 Logic of the Social Sciences. Logical and epistemological examination of the social studies as types of knowledge. Basic problems in philosophy of science with major emphasis upon social science: relationship of theory to fact, nature of induction, nature of causal law, testability, influence of value judgments, etc. Intended for students with considerable maturity in a social science or in philosophy.

420-4 Theory of Logic. Propositions, analysis of terms, theory of inference, both formal and material. Prerequisite: 320.

424-3 Advanced Formal Logic. Special relevance to philosophy students. Includes logical principles, many-valued logics, modal logics, and the logic of imperatives. Prerequisite: 320.

425-3 Philosophy of Language. Introduction to basic problems in the philosophy of language, including alternative theories of meaning and reference and the relation between meaning and intention.

429-4 Philosophy of Mathematics. Major philosophical questions arising from consideration of mathematics: Is mathematical knowledge a priori or empirical? analytic or synthetic? or not knowledge at all? what is the status of mathematical entities such as points, lines, etc. The philosophic implications of the discovery of non-Euclidean geometry discussed. Philosophies of mathematics given, including nominalism, conceptualism and institutionalism, realism, and logicism, and formalism.

441-4 Philosophy of Politics. (Same as Government 441.) Some of the central problems of modern political life, such as sovereignty, world government, authority and consent, the relations of economics and social studies to political theory. Prerequisite: GSC 102 or 340 or consent of instructor.

443-4 Philosophy of History. Classical and contemporary reflections on the nature of history and historical knowledge as the basis for dealing with the humanities. Prerequisite: consent of instructor.

460-4 Advanced Philosophy of Art. The definition of art, its relations to science, culture, and morals; the various types of art defined. Familiarity with at least one of the fine arts is assumed. Prerequisites: GSC 207 or 360, and six courses in music, painting, sculpture, literature, or drama.

465-3 British Moralists. Texts and commentaries for 17th and 18th centuries. Moral philosophy of Hobbes, Locke, Cudworth, Hutcheson, Butler, Price, and Hume. Prerequisite: 340 or consent of department.

- 471-8 (4,4) **The Classic Greek Philosophers.** (a) Plato. (b) Aristotle. Prerequisite: 381 or consent of department.
- 472-12 (4,4,4) **Seventeenth Century Philosophers.** (a) Descartes. (b) Locke. (c) Spinoza. Prerequisite: 383 or consent of department.
- 473-8 (4,4) **Eighteenth Century Philosophers.** (a) Hume. (b) Kant. Prerequisite: 383 or consent of department.
- 474-12 (4,4,4) **Nineteenth Century Philosophers.** (a) Hegel. (b) J. S. Mill. (c) Marx. Prerequisite: 306 or consent of department.
- 477-4 **Latin American Philosophy.** A survey of philosophic thought in Latin America from colonial times through 19th century positivism and the reactions against it, up to recent trends. Reading of original texts in English translations. Discussions and reports.
- 478-4 **Seminar in Latin American Thought.** (See Spanish 478.)
- 482-3 **Recent European Philosophy.** Philosophical trends in Europe from the end of the 19th Century to the present. Phenomenology, existentialism, the new Marxism, structuralism, and other developments. Language, history, culture, and politics.
- 490-2 to 12 **Special Problems.** Hours and credits to be arranged. Courses for qualified seniors and graduates who need to pursue certain topics further than regularly titled courses permit. Special topics announced from time to time. Students are invited to suggest topics for individual study and papers or for group study. Prerequisite: consent of instructor.
- 497-12 (4,4,4) **Honors.** Topic for each quarter will vary. Enrollment restricted to undergraduates. Prerequisite: consent of department.
- 500-4 **Metaphysics.** Recent writers and current problems in metaphysics.
- 501-4 **Philosophy of Religion.** Analysis of a problem in philosophical theology or the phenomenology of religion, or of the work of a particular thinker.
- 503-4 **Philosophical Ideas in Literature.** Metaphysical and ethical world views embodied in representative classics of poetry and prose from ancient to contemporary times.
- 505-4 **Philosophy of Science.** Logic, methods, history, or epistemology of science.
- 510-4 **Indian Philosophy.** Schools, systems, or problems in Indian thought.
- 511-4 **Chinese Philosophy.** Confucianism, Taoism, or Buddhism. Emphasis on comparison of philosophy East and West.
- 512-4 **Philosophy of Culture.** Forms and assumptions of Eastern and Western philosophies.
- 515-4 **Theory of Nature.** Presuppositions of the Western view of nature, the need for revision of causal determinism, and the reintroduction of freedom into the spatiotemporal world.
- 520-4 **Logic.** Recent advances in logic.
- 524-4 **Analytic Philosophy.** Analytic Philosophy of men such as Austin, Ryle, Ayer, Carnap, G. E. Moore.
- 530-4 **Theory of Knowledge.** A contemporary writer or problem in epistemology. Emphasis on problem of reliability and structure of scientific knowledge.
- 531-4 **Whitehead.** Study in depth of a selected aspect or problem in Whitehead's philosophy.
- 540-4 **Philosophy of Journalism.** (See Journalism 540.)
- 542-4 **Political and Legal Philosophy.** Relations of law, morality, and politics, and consideration of problems and issues in philosophy of law.
- 545-4 **Ethics.** Recent British and American ethical theory.
- 550-4 **Theory of Value.** General theory of value or treatment of one or more philosophers on contemporary problems of value.
- 560-4 **Aesthetics.** Selected topics or writings.
- 570-4 **American Idealism.** One or more American idealists. Recent seminars have been devoted to the thought of Brand Blanshard and Peter A. Bertocci.
- 572-4 **Twentieth Century Philosophers.** Inception and development of THE LIBRARY OF LIVING PHILOSOPHERS from Volume I on John Dewey to the present.
- 575-8 (4,4) **Phenomenology and Existential Philosophy.** (a) Phenomenology. The phenomenological tradition and its contemporary transformations. (b) Existential Philosophy. Classical works of existentialism.
- 577-12 (4,4,4) **Dewey.** (a) Metaphysics. (b) Theory of Knowledge. (c) Ethics.
- 579-4 **Bertrand Russell.** Bertrand Russell's theories of meaning, logic, and knowledge.
- 581-4 **Plato.** Thorough study of several of the dialogues. System of Plato as a whole, discussions and reports on the readings.

- 582-4 **Aristotle.** Intensive reading of several texts, illustrating widely varied portions of Aristotle's thought.
- 584-4 **Medieval Philosophy.** Representative philosophers and problems.
- 585-4 **British Empiricism.**
- 586-4 **Spinoza.** Analysis of the improvement of the understanding and the ethics. Medieval tradition and to Spinoza's contemporaries. Discussions and reports.
- 587-4 **Hegel.**
- 588-12 (4,4,4) **Kant.** (a) Critique of Pure Reason. (b) Critique of Practical Reason. (c) Critique of Judgment.
- 590-2 to 16 **General Graduate Seminar.** Selected topics or problems in philosophy.
- 591-1 to 5 **Readings in Philosophy.** Supervised readings for qualified students. Consent of instructor required.
- 599-2 to 9 **Thesis.** Minimum of 5 hours to be counted toward a master's degree.
- 600-3 to 48 **Dissertation.**

Physical Education

- 400-4 **Evaluation in Physical Education.** Historical background of measurement in physical education; selection and evaluation of contemporary testing devices; structure and use of tests; administering the testing program; and interpretation and application of results. Fulfills the tests and measurements course requirements for the Master of Science in Education degree.
- 402-4 **Organization and Administration of Intramural and Extramural Activities.** Planning intramural programs of sports; planning and coordinating extramural activities commonly associated with physical education.
- 403-4 **The Adaptation of Physical and Recreational Activities to the Handicapped Individual.** Recognition of postural deviations; devising and planning programs for the physically atypical.
- 404-2 to 4 **The Teaching of Sports.** Teaching methods, officiating, organization, safety precautions, and selecting equipment for sports.
- 406-4 **Basic Concepts of Physical Education.** The place of physical education in the school program, and the concepts underlying the program. (Required of all students not presenting the undergraduate courses 354 or 340.)
- 407-2 to 4 **Advanced Theory and Techniques in the Prevention and Rehabilitation of Athletic Injuries.** Theoretical and practical methods of preventing and treating athletic injuries.
- 408-4 **Physical Fitness—Its Role and Application in Education.** Improvement of programs and teaching techniques involved in the development of various aspects of physical fitness. Units on postural status; body weight control; tension factors, causes, and control; exercise tolerance; and general body mechanics and control.
- 410-4 **Behavioral Foundations of Coaching.** Behavioral problems of the athlete and coach and possible solutions to such problems. Application of behavioral principles and theories as a basis for understanding the interaction between coach and student in the athletic environment. Prerequisite: Guidance 305 or consent of instructor.
- 415-4 **Workshop in Gymnastics for Women.** For undergraduates and graduates. Techniques and theory of teaching, coaching, judging official performances, conducting gymnastic meets, clinics, and demonstrations. Spotting and analysis of performance.
- 416-4 **Current Theories and Practices in the Teaching of Dance.** (Same as Theater 416.) History and evolution of dance; place of dance in education.
- 420-4 **Physiologic Effects of Motor Activity.** The general physiological effects of motor activity upon the structure and function of body organs; specific effect of exercise on the muscular system. Prerequisite: Physiology 209 or equivalent.
- 444-2 to 8 **Contemporary Dance Workshop.** Dance technique and theory, composition, improvisation, and production. Advanced study of the problems of choreography and production in their presentation as theater. Public performance is required. Prerequisite: one year of technique and theory or equivalent.
- 475-2 to 4 **Individual Research.** The selection, investigation and writing of a research topic under supervision of an instructor. (a) Dance, (b) kinesiology,

(c) measurement, (d) motor development, (e) physiology of exercise, (f) history and philosophy.

500-4 Techniques of Research. Critical analysis of research literature; study of research methods and planning research studies. Prerequisite: 400 or concomitant registration in 400.

501-4 Curriculum in Physical Education. Principals and procedures for curriculum construction and revision; criteria for selecting activities and judging outcomes and the place of the physical education course of study within the total curriculum.

502-4 Foundations of Motor Skills. Application of physiological, kinesiological, and mechanical principles to intelligent control of large-muscle activities. Recommended background: a course in kinesiology.

503-4 Seminar in Physical Education. The course content and its procedures center around group discussions of controversial issues that currently exist in physical education and provide opportunities for practice in seeking unbiased solutions to professional problems.

504-4 Research Projects in Physical Education. Planning, conducting, and reporting original research studies. Prerequisite: 500 or equivalent.

508-4 Administration of Interschool Athletics. Existing problems in interschool athletics, with attention to secondary school athletic programs.

509-4 Supervision of Physical Education. The functions of supervision in physical and health education; basic principles and methods of supervision. Techniques and methods for increasing the effectiveness of the program at the elementary and high school levels.

510-4 Motor Development. Early patterns of motor behavior and the development of physical skills in childhood. The development of physical abilities during adolescence. Individual differences in motor proficiency and factors affecting the acquisition of motor skills. Concepts of motor learning with inferences for improving instructional practices.

511-4 Analysis of Human Physical Movement. Basic human movements as performed by individuals of different ages analyzed. Understanding of movement mechanics at varying levels of skill analyzed.

513-4 Perceptual Motor Learning of Physical Skills. Principles of learning applied to motor performance. Variables that affect learning of physical skills. Prerequisite: consent of instructor.

514-4 Advanced Laboratory Techniques for Physical Exercise. Fundamental theory and procedures of instrument preparation, calibration, and application in data procurement. Prerequisite: 420 or equivalent, consent of department.

515-4 Body Composition and Human Physical Performance. Physical dimensions of the human body as they influence motor performance and are modified by protracted physical exercise. Prerequisite: 420 or equivalent.

517-4 Athletic and Physical Education Facility, Design, Construction, and Maintenance. Basic principles of design, construction, and maintenance of athletic and physical education facilities based upon program characteristics and potential student enrollment. Emphasis on the development of new materials and trends toward new concepts of design and construction. Prerequisite: 354 or equivalent; consent of instructor.

520-4 Metabolic Analysis of Human Activity. Metabolic principles pertinent to human physical performance with emphasis on sport, exercise, and occupational activity analysis. A detailed study of oxygen utilization, oxygen debt, mechanisms of oxygen transport as they relate to physiological homeostasis in localized and total body motor activity. Emphasis on the laboratory study of aerobic and anerobic performance. Prerequisite: 420 or equivalent.

525-1 to 6 Readings in Physical Education. Supervised reading in selected subjects. Prerequisite: consent of instructor and chairman of department. Open only to last-quarter seniors and graduate students.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-2 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Physics

401-3 Mechanics. Rigid body mechanics, normal coordinates, mechanics of continuous media, and advanced principles. Prerequisites: 301, Mathematics 455c, or consent of instructor.

404-6 (3,3) Physical Electronics. Kinetic theory and statistical mechanics with applications to electronic conduction in solids, vacuum, and gases, electron emission and ballistics; Bose-Einstein and Fermi statistics, electron theory of metals; semiconductors; quantum physical phenomena of the solid state. Prerequisites: 304, 305, 401 or consent of instructor.

405-3 Electronics. Advanced theory and application of vacuum tubes and semiconductor devices as circuit elements in power supplies, oscillators, amplifiers, and shaping circuits. Prerequisites: 305 and 309 or consent of instructor.

410-6 (3,3) Introduction to Electromagnetic Wave Theory. A theoretical study of electromagnetic wave generation, propagation, and detection, with applications to microwaves and modern optics. Prerequisite: 305, 310.

415-12 (3,3,3,3) Modern Physics. Elements of wave mechanics, special relativity, atomic, molecular, and nuclear physics. Prerequisites: 301, 305b, Mathematics 455c, or consent of instructor.

418-1 to 4 Modern Physics Laboratory. Advanced laboratory work with pulsed and continuous lasers and optical detectors, nuclear magnetic resonance, nuclear spectroscopy, vacuum techniques, mass and beta spectroscopy, and semiconductor physics.

420-2 to 5 Special Projects. Each student is assigned to a definite investigative topic. Adapted to advanced undergraduate students. Prerequisites: 301, 305.

447-5¹ Topics in Classical Physics. Assists experienced teachers to improve their understanding of classical physics and the strategy of presenting it. Emphasis on demonstration of phenomena as basic strategy in the introduction of new material. Attention given to the design of demonstration apparatus. Related laboratory experience is an integral part of the course. Prerequisite: consent of department.

448-5¹ Topics in Modern Physics. Assists experienced teachers to extend their understanding of modern physics. Lectures and demonstrations aim at improvement of the means of presenting the ideas of modern physics. Related laboratory experience is an integral part of this course. Prerequisite: consent of chairman of department.

449-3¹ (1,1,1) In-Service Institute for Teachers of Physics. A series of lectures, demonstrations, discussions, and films to assist teachers of high school physics in meeting their classroom problems and responsibility. Prerequisite: consent of chairman of department.

504-12 (4,4,4) X-Ray Diffraction and Lattice Dynamics. (See Applied Science 504.)

510-9 (3,3,3) Classical Mechanics. Variational principles and Lagrange's equations; rigid body motion; special relativity; canonical equations, small oscillations including non-linear problems; perturbation methods; classical theory of field. Prerequisite: 401.

511-9 (3,3,3) Mathematical Methods of Physics. Elements of theory of analytic functions; differential equations and special functions of mathematical physics; solutions of boundary value problems by Hilbert space expansion. Prerequisite: Mathematics 455c or equivalent, or consent of instructor.

520-2 to 5 Special Projects. Each student assigned a definite investigative topic requiring resourcefulness and initiative. Prerequisite: consent of instructor.

530-9 (3,3,3) Electromagnetic Theory. Maxwell's Formalism of classical electromagnetism, application of electrostatics, magnetostatics, electrodynamics and radiation problems. Prerequisite: 305.

531-9 (3,3,3) Quantum Mechanics. Wave mechanics, matrix mechanics, transformation theory of quantum mechanics; angular momentum, perturbation theory, scattering theory. Prerequisites: 415, Mathematics 455c or consent of instructor.

532-9 (3,3,3) Advanced Quantum Mechanics. Introduction to quantum field theory, with emphasis on the quantum theory of radiation; covariant quantum electrodynamics; special topics, depending on the interests of students. Prerequisites: 531 and consent of instructor.

540-9 (3,3,3) Nuclear Physics. Fundamental properties and systematics of nuclei, scattering theory, the nuclear two body problem, nuclear models, electromagnetic properties of nuclei, particle radioactivity, nuclear reactions, the optical model. Prerequisite: consent of instructor.

¹ Open to teachers of high school physics, to National Science Foundation Institute participants, and to others who have received the consent of the chairman of the Department of Physics and Astronomy or the director of the institute. May count toward the Master of Science in Education degree with approval of the Department of Secondary Education.

550-9 (3,3,3) Atomic and Molecular Spectra. Detailed quantum mechanical treatment of atomic and molecular spectroscopy. Prerequisite: consent of instructor.

560-9 (3,3,3) Statistical Mechanics. Principles of classical and quantum equilibrium statistics; fluctuations; applications to specific problems of physics. Prerequisite: consent of instructor.

570-9 (3,3,3) Solid State Physics. Fundamental concepts in solid state physics from advanced viewpoint, with illustrations drawn from current research. Prerequisite: consent of instructor.

575-1 to 4 Graduate Seminar. Lectures on special topics to be given when a demand arises. Prerequisite: consent of instructor.

580-3 to 6 Selected Topics in Physics. Topics of special interest. Prerequisite: consent of instructor.

592-1 Colloquy in Molecular Science. Required each quarter of all resident students who have been admitted to advanced study in molecular science. Weekly conference on current research and recent literature of the field.

597-3 to 45 Special Topics in Molecular Science. Prerequisite: admission to the molecular science doctoral program and consent of instructor.

598-3 to 25 Special Projects in Molecular Science. Prerequisite: admission to the molecular science doctoral program and consent of instructor.

599-1 to 9 Thesis.

Physiology

410-15 (5,5,5) Advanced Human Anatomy. Dissection of the human body. Prerequisite: consent of instructor.

414-4 Anatomy and Physiology of Speech and Hearing Mechanisms. The anatomy and physiology of the vocal apparatus. Primarily for majors in speech pathology. 2 hours lecture, 3 hours laboratory.

415-8 (4,4) Experimental Animal Surgery. (a) Preparation of animals for surgery. Anesthesia, instruments, care of animal quarters, selected exercises. (b) Special surgical exercises. 2 hours lecture, 4 hours laboratory. Part b may be elected independently of a only by permission of the instructor.

417-8 (4,4) Principles of Pharmacology. Action of drugs and other chemical substances upon the living organism. Physiological and biochemical events resulting from the action of drugs. Pharmacodynamics, chemo-therapy, toxicology, and therapeutics. Prerequisites: basic courses in chemistry and mammalian physiology or equivalent. 3 hours lecture, 2 hours laboratory.

430-12 (3,3,3,3) Cellular Physiology. The nature and mechanism of the living cell. Chemical and physical aspects of vital activity.

433-4 Comparative Physiology. Fundamental physiological processes and the manner in which they vary in various groups of animals. Recommended for majors in physiology and for students in other biological sciences. 3 hours lecture, 2 hours laboratory.

440-3 Electron Microscopy. Lectures, demonstrations, and practical experience with the electron microscope. Fundamentals of specimen preparation. Open to students with advanced knowledge of any natural or physical science. 2 hours lecture, 2 hours laboratory.

450-4 to 16 Special Problems in Physiology. Eight hours laboratory. Prerequisite: consent of department.

456-4 to 12 Independent Research for Honors. Supervised research and investigation in different branches of physiology. Prerequisite: consent of instructor and chairman. Open to undergraduate honors students only.

460-15 (5,5,5) Mammalian Physiology. Function and biochemical organization in mammals, especially man. Open to students with adequate courses in biological sciences and chemistry. (a) Blood, circulation, respiration. (b) Digestion, excretion, endocrines. (c) Muscles, nervous system sense organs. 3 hours lecture, 4 hours laboratory.

465-9 (3,3,3) Biophysics. Principles of measurement. Physiology of man in his physical environment. Internal physics of the human body as it functions, including the vital organs. Prerequisite: two terms of physics or consent of instructor.

471-9 (3,3,3) Biophysical Instrumentation. Principles of electronics, accenting solid state circuit designs that apply to biophysics, biology, or the physical sciences. Circuit construction for instruments included. Prerequisite: 2 quarters of physics or consent of instructor.

500-1 to 9 Advanced Seminar. One meeting per week, 1 credit per quarter. Presentation of research and current literature in physiology. Required of all majors for at least 3 quarters for master's degree and 3 additional quarters for doctoral students.

519-4 Endocrinology. Methods of analysis and instrumental techniques used in advancing knowledge of the role of the endocrine glands and their drug principles in human and animal behavior. Prerequisite: strong background in chemistry and the biological sciences. 3 hours lecture, 2 hours laboratory.

520-9 (3,3,3) Physiological Techniques. Three terms of biophysics. (a) Analysis of protoplasmic components of tissue extracts under a variety of physiological conditions using chemical and physical procedures. (b) Gas analysis and metabolic methods in physiology. (c) Instrumentation for the recording of the physiologic activity of living tissues and organs. Use of channel recorders. Prerequisite: undergraduate concentration in any of the biological or physical sciences. 2 hours lecture, 4 hours laboratory.

521-1 to 6 Readings in Current Physiological Literature. Open only by consent.

540-8 (4,4) Advanced Comparative Physiology. Physiological processes among animals. Prerequisites: courses in chemistry and biological sciences. 3 hours lecture, 2 hours laboratory.

550-3 Radiation Biology. Theory and specific applications of isotopes in physiology emphasized, and opportunity given to learn how to handle radioactive materials in the laboratory. 2 hours lecture, 2 hours laboratory. Prerequisites: general physics and biochemistry or equivalent.

565-3 Biophysics. Equivalent to 465c with additional readings. Prerequisite: 465b.

599-3 to 9 Thesis. 9 hours to be counted toward a master's degree.

600-1 to 48 Dissertation. Hours and credit to be arranged by chairman and adviser.

Plant Industries

401-4 Soil Physics. Physical properties of the soil; factors affecting them, their measurements, evaluation, and their influence in determination of soil productivity. Prerequisite: 301.

402-4 Soil Morphology and Classification. Morphology and soil formation, description and identification of soil profiles, classification of soils, techniques of soil mapping, and interpretation of survey data. Field trips approximate cost \$6. Prerequisite: 301.

403-4 Soil Chemistry. Emphasis on inorganic and organic colloids in the soil, ionic exchange, oxidation-reduction processes, acidity, alkalinity, and salinity, and how each relates to plant nutrition and growth.

404-3 Turf Management. Principles and methods of establishing and maintaining turf for homes, recreational areas, and public grounds. Study of basic plant and soil materials, fertility, culture, water management, and pest control as related to turfgrasses in variable environments. Field trips cost not more than \$2. Prerequisite: GSA 201b or equivalent.

406-5 Radioisotopes, Principles and Practices. Lectures on the principles of radioisotope technology as applied to agricultural and biological sciences. Prerequisites: general chemistry and biochemistry or equivalent.

407-5 (3,2) Fertilizers and Soil Fertility. (a) Lecture. The uses of fertilizer materials; effects of various fertilizers on soils and crops; fertility maintenance and soil management. Prerequisite: one course in soils. (b) Laboratory. The laboratory study of the chemistry and fertility of soils. Parallels the theoretical presentation given in 407a. Prerequisites: 407a or concurrent enrollment.

408-4 World Crop Production Problems. Ecological and physiological factors influencing reproduction in various areas of the world. Natural limitations on crop production. Nonagricultural factors influencing world crop output. Prerequisite: 109.

409-3 Crop Physiology and Ecology. The effects and significance of physiological and ecological parameters on crop yields. Prerequisite: Botany 320 or consent of instructor.

415-4 Plant Breeding. Principles of plant breeding emphasized together with their application to the practical breeding of horticultural, agronomic, and forest plants. Prerequisite: any course in genetics.

418-4 Weeds and Their Control. Losses due to weeds, their identification and distribution, methods of weed dissemination and reproduction. Mechanical,

biological, and chemical control of weeds. "Bioactivity of herbicides." State and federal legislation pertaining to weed control herbicides. Herbicide commercialization. Field trips. Prerequisite: GSA 201b.

419-4 Forage Crop Management. Forage production and utilization; forage crop characteristics, breeding, and ecology; grasslands as related to animal production, soil conservation, crop rotation, and land use. Field trip approximate cost \$3. Prerequisite: GSA 201b.

424-5 (3,2) Soil Microbiology. (a) (Lecture). (Same as Microbiology 424.) A study of the numbers, characteristics, and biochemical activities of soil microorganisms, with particular consideration of their role in the transformations of organic matter, nitrogen, and minerals as related to soil fertility and management. Prerequisites: one course in microbiology or soils. **(b) (Laboratory).** Experiments designed to determine numbers, and to study the characteristics and biochemical activities of the soil microflora as related to fertility. Prerequisites: 424a, or concurrent enrollment, Microbiology 301.

437-4 Commercial Vegetable Production. Culture, harvesting, and marketing of commercial vegetables. Field trips cost approximately \$3.00. Two-hour laboratory. Prerequisite: 264 or consent of department.

438-3 Advanced Studies in Vegetable Crops. Genetics, morphological, and physiological factors influencing the production of vegetable crops. Offered in alternate years. Prerequisite: 264, Botany 320, or consent of department.

440-5 Plant Propagation. Fundamental principles of asexual and sexual propagation of horticultural plants. Actual work with seeds, cuttings, grafts, and other methods of propagation. Prerequisites: 264.

444-4 Floriculture. Principles governing production, timing, and marketing of the major floricultural crops grown in the commercial greenhouse. Field trip. Prerequisite: 264.

456e-2 Agricultural Marketing Problems and Practices—Horticultural Crops. (See Agricultural Industries 456e.)

507-3 Advanced Soil Fertility. Theoretical principles of soil fertility; evaluation of research data and methods used in soil fertility research. Prerequisite: 407a.

518-4 Principles of Herbicide Action. Chemistry and mode of action of herbicides. Nature of herbicidal action. Illustrates the various types of chemical weed control procedures in current use. The physiology of herbicidal action examined using the different mechanisms established for various chemical groups of herbicides. Prerequisite: 418, Botany 320.

520-1 to 6 Readings. Contemporary books and periodicals on selected subjects within the fields of plant industries. Prerequisite: consent of department.

533-5 Growth and Development in Plants. Physiological control of developmental processes. Emphasis on exogenous growth-regulating compounds and their behavior in plants. Prerequisite: Botany 320 or consent of instructor.

575-1 to 6 Research. Directed research on approved projects investigating selected fields of the plant industries. Prerequisite: consent of department.

581-1 to 6 Seminar. Group discussions of and individual papers on subjects and problems relating to soils, field and horticultural crops, and other phases of the fields of the plant industries. Prerequisite: consent of department.

588-1 to 12 International Graduate Studies. Residential graduate study programs abroad. Approval of department required both for the nature of program and the number of quarter hours of credit.

590-1 to 4 Special Studies in Plant Industries. Directed study in specialized areas of crop production, horticulture, or soils depending on the program of the student. Discussions, seminars, readings, and instruction in research techniques. Prerequisite: consent of department.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree. Prerequisite: consent of department.

Psychology

404-4 Theories of Perception. An examination of the different theories concerned with an organism's sensory contact with his environment. Physiological, social, and organizational theories of perception will be considered. Prerequisite: 211b or consent of instructor.

407-4 Theories of Learning. A consideration of the major contemporary learning theories and their relation to experimental data. Prerequisite: 211b or consent of instructor.

- 408-4 Theories of Motivation.** Systematic analysis of the concept of motivation with emphasis on its utility as an explanatory component of general behavior theory. Prerequisite: 211b or consent of instructor.
- 414-4 Advances in Physiological Psychology.** Reading and discussion of articles dealing with recent significant advances in the neuroendocrine bases of behavior. Emphasis on readings and discussion by the students. Prerequisite: 314, GSA 302 or consent of instructor.
- 415-4 Psychopharmacology.** The effects of drugs on psychological processes and on the behavior of humans and animals. These effects related to the physiological and biochemical alterations that drugs produce. Prerequisite: Chemistry 110 or 121a, and GSA 301, and GSB 201c, or consent of instructor.
- 421-4 Psychological Tests and Measurements.** Principles of psychological measurement, including errors of measurement, techniques for estimating reliability and validity, techniques of test construction, and problems in assessment and prediction. The laboratory will include the use of selected instruments. Lecture and laboratory. Prerequisite: 8 hours of psychology.
- 425-4 Mathematical Psychology.** A survey of mathematical models of behavior, elementary models of learning, perception, and decision making are examined with a view towards introducing the student to the literature in mathematical psychology. Prerequisite: Mathematics 410a, 421a, 480a or consent of instructor.
- 431-4 Psychopathology.** Classification, description, etiology and treatment of the disorders of personality organization and behavioral integration. Observations in a state mental hospital. Prerequisite: 305 or consent of instructor.
- 440-4 Theories of Personality.** A review and critical evaluation of major personality theories and their supporting evidence. Prerequisite: 305 or consent of instructor.
- 451-4 Advanced Child Psychology.** An examination of the concepts, methods, and problems of human development with consideration of both its psychological and psychosocial aspects. Prerequisite: 211b, and 301, or consent of instructor.
- 459-4 Theory and Practice in the Preschool.** Designed for those in nursery education and related fields. Examines variety of topics and provides lectures, demonstrations, and practicum experience in the Child Study Cooperative Nursery. Prerequisite: consent of instructor.
- 461-4 Advanced Social Psychology.** Examines current areas of interest in the study of social behavior: language behavior, communication, social influence, attitude change, interpersonal perception, etc. Emphasis is on the individual in the social context. Prerequisite: 307 or consent of instructor.
- 465-4 Group Dynamics and Individual Behavior.** Examination of research and theory in the area of small-group interaction. Examines such topics as group structure and function, group problem-solving, leadership, etc. Prerequisite: 307 or consent of instructor.
- 467-4 Psychology of Black Americans.** Critical examination of the issues in research and theory. Psychological differences between Black and White Americans. Includes self-concept, personality and temperament, intellectual functioning, behavioral genetics, socialization practices, and intergroup and intragroup relations. Prerequisite: 307 and GSE 201c.
- 479-4 Animal Behavior.** (See Zoology 479.)
- 490-1 to 16 Independent Projects.** Independent readings and projects in psychology. Prerequisite: consent of instructor and chairman.
- 495-1 to 18 Seminar: Selected Topics.** Varied content. To be offered from time to time as need exists and as faculty interest and time permit. Prerequisite: consent of chairman.
- 509-4 Instrumentation in Behavioral Science.** Study of methods of research instrumentation. Techniques of stimulation and of physiological and psychological response recording. Lecture and laboratory. Prerequisite: consent of instructor.
- 510-4 History and Systems.** Study of the important antecedents of contemporary scientific psychology. Considers issues, conceptual developments, and research advances, and presents the major schools and systems. Prerequisite: consent of instructor.
- 512-4 Sensory Processes.** A study of the structure and functions of the sense organs. Emphasis will be placed on the psychological data which describe the function of these organs. Lecture and laboratory. Prerequisite: consent of instructor.
- 514-8 (4,4) Physiological Psychology.** Study of neural and endocrine mech-

anisms underlying behavioral processes. Lecture and laboratory. Prerequisite: consent of instructor.

516-4 Learning Processes. Processes by which individual behavior is changed, using procedures developed in the learning laboratory. Introduction to major concepts and data of learning. Prerequisite: consent of instructor.

522-4 Research Design and Inference III. Advanced design and analysis of psychological experiments. Analysis of variance in complex designs, analysis of covariance, and trend analysis. Prerequisite: Mathematics 410B.

523-2 Research Seminar. Evaluation of Research. A study of principles of research design from the point of view of the scholar reading the journals.

524-4 Multivariate Methods in Psychology. A detailed coverage of psychometric methods, with special emphasis on the theory and applications of multivariate regression analysis. Includes an introduction to factor analysis. Prerequisite: 522.

525-4 Mental Test Theory. Derivation of the basic psychometric equations, effects of test length and group heterogeneity on test parameters, criteria of parallel tests, weighting and differential prediction. Prerequisite: 524.

526-4 Experimental Design in Psychology. Consideration of the logic of psychological experimentation. Topics include randomization as related to experimental inference, complex designs used in experimental psychology, the use of concomitant information in experiments, faults and refinements in common psychological designs. Prerequisite: 522, Mathematics 410a,b.

530-4 Personality Theory and Dynamics. Intensive treatment and critical analysis of several representative approaches to personality. Consideration also of important personality concepts common to most theoretical approaches. Prerequisite: consent of instructor.

531-8 Advanced Psychopathology. Consideration of special topics, including psychological theories of the nature and etiology of human pathology, assessment of pathology, and institutional care and treatment. Includes extensive field experience in a mental hospital setting. Graded S/U only. Prerequisite: 530, 541, and consent of instructor.

532-2 Experimental Approaches to Personality. Presentation of conceptual formulations and research data from representative experimental approaches to personality. Critical evaluation of methodological approaches to personality study. Prerequisite: 530 or consent of instructor.

533-3 Experimental Approaches to Psychopathology. An examination of the research literature on several issues in clinical psychopathology. Prerequisite: consent of instructor.

536-4 Fundamentals of Counseling. Introduction to the common assumptions, dimensions, and communicative skills underlying psychological counseling. Observation utilized to supplement didactic discussion. Lecture and demonstration. Prerequisite: consent of instructor.

537-4 Counseling and Psychotherapy. Systematic presentation of major approaches to counseling and psychotherapy. Consideration of salient aspects of the therapeutic situation and of the process and nature of changes during psychotherapy. Critical evaluation of both theory and practice. Consideration of research findings and problems. Prerequisite: consent of instructor.

538-2 Group Psychotherapy. Presentation of major approaches to group psychotherapy. Prerequisites: 537 and consent of instructor.

539-4 Experimental Approaches to Psychotherapy. A review and evaluation of empirical research related to the amelioration of maladjustment. Emphasis is on measurement and methodological problems. Prerequisite: 536, 537, or consent of instructor.

541-4 Psychodiagnostics I. Introduction to clinical psychology with attention to the function and clinical use of individual intelligence tests. Theories of intelligence and related research. Age scales with emphasis on infant and child testing. Point scales and tests of deterioration with emphasis on child and adult testing. Lecture and practicum. Prerequisites: consent of instructor.

543-6 (4,2) Psychodiagnostics II. Basic theory and assumptions underlying projective methods. Use of projective techniques as measures of personality and as tools for clinical diagnosis and research. (a) Thematic projective techniques. (b) Rorschach and Bender-Gestalt. Lecture and practicum. Prerequisite: 541 or consent of instructor.

545-2 Psychodiagnostics III. Nature and theory of questionnaires for personality assessment and psychodiagnosis. Consideration of their use in clinical research. Lecture and practicum. Prerequisite: consent of instructor.

547-4 Assessment Procedures in Counseling. Use and integration of psycho-

logical test data, vocational, socio-economic, and educational information in assessment and counseling. Prerequisite: 421 or consent of instructor.

552-4 Experimental Child Psychology. Consideration of relationship of methodology to child theory, typical methodological procedures and problems specific to children, and representative research topics. Prerequisite: 451 or consent of instructor.

554-2 Developmental Theory. Systematic study and critical evaluation of theories of child behavior. Prerequisite: 451 or consent of instructor.

556-2 Psychological Treatment of the Child. Investigation of personality and behavior problems. Etiological factors and methods of treatment. Prerequisite: 451 or consent of instructor.

561-4 Social Influence Processes. Critical review of theoretical and empirical developments in the study of influence processes, attitude change, etc. Social and intrapersonal determinants are examined. Prerequisite: 461 or consent of instructor.

562-4 Observational Techniques and Content Analysis. Examination and evaluation of research methods and measurement techniques utilized in social psychology. Prerequisite: 461 or consent of instructor.

564-4 Communication and Group Behavior. Emphasis in this course is on language behavior and the psychological study of the communication process. Examines theories, methods and research in these areas. Prerequisite: 471 or consent of instructor.

571-4 Industrial Motivation and Morale. A review of the factors which determine motivation and morale as well as their measurement and evaluation. Prerequisite: 320 or consent of instructor.

573-2 Selection and Placement. Selection and validation of test batteries, use of the interview and personal history data in selection, quota, and classification problems, administration of a selection program. Prerequisite: 524 or consent of instructor.

574-2 Psychology of Industrial Relations. Analysis of psychological factors involved in industrial organization, employer-employee relations, and union-management relations. Prerequisite: 571 or consent of instructor.

576-2 to 4 Human Engineering. Analysis of man-machine systems, human factors in the design of display and control systems, limitations and capabilities of the operator. Prerequisite: 512, 581, or consent of chairman.

581-4 Psychophysical Methods. Survey of the major psychophysical methods and their applications. Lecture and laboratory.

590-1 to 16 Readings in Psychology. Readings in selected topics in psychology under staff supervision. Graded S/U only. Prerequisite: consent of chairman.

591-1 to 36 Research in Psychology. Research under staff supervision in selected areas of psychology. Graded S/U only. Prerequisite: consent of the chairman.

593-1 to 18 Practicum in Psychology. Practicum experience in a professional setting is offered under staff supervision in the following areas: (e) Clinical Psychology, (f) Counseling Psychology, (h) Industrial Psychology, (j) Child Psychology, (l) Teaching of Psychology. Graded S/U only.

595-1 to 18 Advanced Seminar. Seminars of varied content for advanced students. Prerequisite: consent of chairman.

598-2 Ethical and Professional Problems in Psychology. Problems in the professional practice of psychology and in teaching and research. Professional ethics, relations to other professions and the public, organization and structure of the field, current trends. Prerequisite: major in psychology or consent of instructor.

599-1 to 9 Thesis.

600-1 to 45 Dissertation.

Radio-Television

470-4 Advanced Film Production. Writing, filming, and editing of short film documentaries. Students work individually and in crews. Film and laboratory fee. Prerequisite: 370 or Cinema and Photography 355.

475-1 to 8 Individual Study. May be repeated for a total of 8 hours, but for no more than 4 hours in one quarter. Assignments made by radio-television instructors. Prerequisite: consent of instructor.

490-4 to 8 Theater-Television Workshop. (Same as Theater 490.) Offered for two quarters, spring and summer. Experimental workshop in theatrical tele-

vision involving lighting, blocking, rehearsing, video taping, and production technique. Two-quarter sequence suggested. Prerequisite: 364, 369, 374, 383, or consent of instructor.

Recreation and Outdoor Education

420-3 to 4 Human Development and Behavior. Consideration of human development from the framework of the major theories. Includes acquisition and maintenance of diverse behavior patterns. Prerequisite: advanced standing.

425-3 Recreation Areas and Facilities. Principles of planning, construction, management and maintenance of shelters, utilities, sanitation structures, erosion control, and other related problems.

450-4 Performing Arts in Recreation and Education. Principles, materials, and techniques of producing all types of drama, music, and dance activities for a variety of recreation and education settings and population groups.

470-4 School and Community Recreation. The role of the public schools in community recreation. Emphasis on current practices and trends in curriculum content, adult education, extracurricular activities, after-school and vacation programs, and cooperative programs with other agencies.

490-12 to 16. Internship in Recreation and Outdoor Education. Experience in a professional setting. Emphasis on administrative, supervisory, teaching, and program leadership. School, community, industrial, agency, park and forest, and other situations. Not counted toward requirements of a graduate program.

500-4 Principles of Recreation. Principles and interpretations of recreation and the basic concepts underlying the organization of leisure activity. Emphasis on cultural significance of recreation and the relationship of recreation to the totality of life.

510-4 Outdoor Education Workshop. Leadership development for outdoor education and its place in the school program. Methods of utilization of natural and cultural resources for enrichment of the school curriculum.

520-4 Recreation Administration Workshop. Bases for planning community programs in recreation. Administrative problems including legislation, finance and budget, office management, public relations, and personnel are considered through application of principles.

525-4 Special Population Workshop. Basis for planning, organization, selection, evaluation, and adaption of activities to a variety of institutional and community recreation settings.

530-4 Recreation Program Workshop. Program planning, organization, and implementation of comprehensive leisure time programs in public and private recreation settings, emphasis on application of basic program principles to practice. Prerequisite: 500.

540-4 Planning Outdoor Areas for Education and Recreation. Scope, content, objectives, procedures, and types of recreation surveys and appraisals. Practical experience with the master plan. Prerequisite: 500.

570-4 Seminar in Recreation and Outdoor Education. Discussion of individual projects; presentation of research problems and dissertation topics.

596-2 to 9 Independent Study. Independent study and research in the student's field of interest.

Rehabilitation

414-1 to 16 Developing Employment Opportunities. Designed to train rehabilitation personnel in the attitudes, methods and skills pertinent to placement of handicapped persons in competitive and other occupations. Prerequisites: special standing and consent of instructor.

417-4 Rehabilitation of the Economically Deprived. Analysis of employment problems of the economically deprived with attention to training, counseling, and programs for rehabilitation.

420-4 Human Development and Behavior. Consideration of human development from the framework of the major theories, to include acquisition and maintenance of diverse behavior patterns. Prerequisite: advanced standing.

480-2 to 4 An Introduction to Rehabilitation. Philosophy, procedures, and practices underlying the rehabilitation movement, including the historical,

social cultural, and economic factors and recent legislation that have contributed to its rapid development.

481-2 An Introduction to Employment and Developmental Services. A review of the development and growth of employment services and special youth centers, current social needs and trends, and the organizational patterns in such centers.

485-4 Scientific Methods in the Behavioral Sciences. Scientific methods as an approach to the investigation of human behavior including consideration of various systems of behavior theory and practice.

486-4 Introduction to Behavior Modification. Overview of the field of behavior modification, its procedures, techniques, and methods. A survey of current literature examining the various populations being utilized.

490-1 to 6 Readings in Rehabilitation. Select readings supervised by the staff. Prerequisite: consent of instructor.

501-6 (2,2,2) Rehabilitation Administration. (a) Programming and organizational structures, formal and informal, of public and voluntary agencies and facilities. (b) Current and progressive supervisory practices in rehabilitation agencies, communication channels, employee counseling and evaluation methods. (c) Developing community resources, involvement and utilization of public and voluntary agencies in developing a comprehensive rehabilitation program. Prerequisite: consent of instructor.

503-2 Case Management in Rehabilitation. Basic procedures in providing and coordinating available services for the handicapped in the context of a professional-client relationship. Prerequisite: consent of instructor.

511-2 to 4 Vocational Development and Occupational Choice. The psychosocial meaning of work, vocational development and theory of occupational choice, and the analysis of the labor market now and in the future. Prerequisite: consent of instructor.

519-2 to 3 Selection, Placement, and Follow-up. A survey of current methods and criteria used in job development, selective placement, and follow-up of handicapped and deprived individuals. Prerequisite: consent of instructor.

520-4 Functional Analysis of Behavior. Analysis of operant and respondent behavior with emphasis on the contribution of infrahuman investigations to the understanding of human behavior. Laboratory required. Prerequisite: consent of instructor.

521-4 Child Behavior. Systematic examination of the manner in which children (from conception on) acquire and maintain their behavior patterns and the role of the environment in controlling such development. Prerequisite: consent of instructor.

526-4 Complex Human Behavior. The manner in which humans acquire, maintain, and attenuate the more complex forms of behavior, particularly in the social, vocational, and educational areas of behavior. Prerequisite: consent of instructor.

531-2 to 4 Vocational Appraisal. Consideration of tests and procedures used in assessing the individual's functioning abilities and the meaning work has in achieving fulfillment, which also includes the requirements of the job for purposes of aligning the two. Prerequisite: 511 or consent of instructor.

532-3 to 4 Assessment Procedures in Rehabilitation. A general review of the fundamental bases of measurement, the criteria for selecting assessment devices, introduction to select standardized and time-sample instruments, and the use of these in rehabilitation. Prerequisite: consent of instructor.

533-4 Measurement in Behavior Change. Dividing the types of measurement into two categories, direct and indirect, an analysis of the relative advantages or disadvantages inherent in each technique when applied to specific behavior areas. Prerequisites: consent of instructor.

535-4 Schedules of Reinforcement. A study of schedules as a basis for understanding and controlling behavior, and the nature of schedule effects in relation to other behavioral variables. Prerequisite: consent of instructor.

536-4 Individual Assessment in Rehabilitation. Theoretical aspects of measuring instruments for individual assessment in rehabilitation. Includes problems in administration and interpretation. Field and laboratory experiences included. Prerequisite: 532 and consent of instructor.

537-4 Diagnostic Procedures for Special Populations. A detailed survey of the procedures in diagnosis and assessment of the retarded, blind, deaf, brain injured, and others. May include some laboratory assignments. Prerequisites: 532 and consent of instructor.

539-1 to 6 Behavioral Programming. Application of the technologies related to the arrangement of behavioral programs. Laboratory required. Prerequisite: consent of instructor.

541-1 to 6 Medical Aspects of Rehabilitation. A review of human systems, disfunctions leading to major diseases entities and injuries, and the implications for rehabilitation. Prerequisite: consent of instructor.

543-4 Structural Basis of Behavior. Structural basis of the respondent and operant behavior systems and their relationship to environmental variables effecting both systems. Prerequisite: 520 and consent of instructor.

551-3 to 4 General Rehabilitation Counseling. An overview of the basic counseling processes appropriate to rehabilitation settings. Includes consideration of the stylistic and interpersonal factors common to various persuasions. Prerequisite: consent of department.

552-4 Rehabilitation Counseling Research. An intensive study of the heuristic aspects of theory and the resultant research in rehabilitation counseling. Also develops researchable problems. Prerequisite: 551.

555-2 Rehabilitation Counseling with the Mentally Retarded. Review and discussion of the philosophy, issues, approaches, and research pertinent to the counseling function in the development of the retarded. Prerequisite: 551 or concurrent registration.

556-2 to 4 Group Procedures in Rehabilitation. Characteristics of intensive group experiences, and procedures in preparation for group counseling. Prerequisites: 551.

558-4 Programmed Instruction and Behavior. Techniques and procedure in programming material for rapid acquisition of new behavior with particular emphasis on automated instruction and programmed texts. Prerequisite: consent of instructor.

561-2 to 3 Psycho-Social Aspects of Disability. An examination of the socio-emotional impact of traumatic injury or chronic illness (on human functioning) and its role in the rehabilitation process. Prerequisites: consent of instructor.

563-4 to 8 Aversive Control and Aggressive Behavior. Methods of aversive control and negative reinforcement procedures. A review of the aggressive response as a consequence of aversive control. Prerequisite: consent of instructor.

564-4 Sexual Behavior. The definition and measurement of sexual responses, their significance and importance for understanding complex behavior patterns. Prerequisites: consent of instructor.

565-4 Verbal Behavior. Theoretical and empirical study of human verbal behavior. Emphasis on the environmental control of such behavior. Analysis of procedures used to modify deviant and retarded verbal responses. Prerequisite: consent of instructor.

567-4 School-Related Behavior. An intensive analysis of the students' and teachers' behavior, its functional relationship, and the ways in which behavior modification techniques might create a more satisfactory environment for teaching and learning. Prerequisites: consent of instructor.

571-1 to 6 Seminar in Selected Topics. Selected topics of pertinence to rehabilitation and counseling personnel. Prerequisite: consent of department.

574-1 to 12, Seminar in Pastoral Counseling. Aspects of counseling and the helping relation that are relevant in pastoral settings. Includes the special problems involved in pastoral counseling. Prerequisite: consent of instructor.

576-1 to 12 Seminar in Behavior Modification. Basic issues involved in the modification of human behavior in the applied areas—scientific, methodological, ethical and social issues will be evaluated. Prerequisite: consent of instructor.

578-1 to 6 Seminar in Correctional Rehabilitation Counseling. (Same as Administration of Justice 578.) Review of major issues and research relative to rehabilitation practices in youth and correctional settings. Prerequisite: consent of instructor.

585-0 to 24 Practicum in Rehabilitation. (a) Practice in various facilities and agencies including supervised experiences in the function and administration of these services. (b) Application of behavioral methods with humans under close direction of supervisory staff. (c) Practice in developing counseling skills with individuals and groups in varied settings. Prerequisite: consent of instructor.

589-0 to 12 Internship in Rehabilitation. Full-time practice in a rehabilitation setting supervised by both agency personnel and university faculty. Prerequisites: 585 and consent of department.

590-1 to 16 Independent Projects. Independent development of projects and systematic readings in pertinent rehabilitation areas. Prerequisite: consent of instructor.

591-1 to 16 Research in Rehabilitation. Systematic research on factors and procedures relevant to rehabilitation. Prerequisite: consent of instructor.

599-1 to 9 Thesis. Prerequisite: consent of instructor.

Secondary Education

402-4 Aerospace Education Workshop. Teachers learn about current developments in this area and how to incorporate aerospace information into existing curricula. They study in some detail the social, political, and economic consequences of this era.

407-8 (4,4) The Middle and Junior High School. (a) Organization, administration, and curriculum of the middle and junior high schools. (b) Workshop. Enables teachers to discover and evaluate new content, methods, and materials available for the middle school and junior high school and develops teacher-made functional instructional models. Must be taken in a,b sequence. Middle or junior high school teaching experience may be substituted for a as a prerequisite to b.

409-4 Teaching Distributive Education. For those who plan to become teacher-coordinators of vocational co-operative or in-school distributive education programs. Includes planning of facilities; selection and review of course content; preparation of instructional materials; organization and arrangement of units; related instruction; simulated block, and project plans; and student evaluation. Prerequisite: Marketing 301.

410-4 Teaching Consumer Education. For those who plan to become teachers of consumer education courses in secondary schools and junior colleges. Emphasis on meeting the state requirements for teachers of consumer education in Illinois. Includes selection and study of units of study; planning an evaluation program. Prerequisite: GSB 346, or Finance 305 or equivalent.

485-3 Principles and Philosophies of Vocational and Technical Education. (See Occupational Education 485.)

487-4 Teaching the Natural Sciences in Secondary Schools. Objectives of science education; instruction methods and techniques appropriate for teaching science; desirable equipment, audio-visual aids, and instructional material; development of a course outline and at least one instruction unit. Prerequisite: 310 or concurrent.

488-4 Teaching Social Studies in Secondary Schools. Objectives, scope and sequence of curriculum, methods of teaching, materials and evaluation. Prerequisite: 310 or concurrent.

490-4 Workshop in Economics Education. (Same as Economics 490.) Designed to assist elementary and secondary school teachers in promoting economic understanding through the translation of economic principles and problems into classroom teaching materials.

495-2-4 Seminar: Problems Related to Teaching Disadvantaged Youth. For members of the National Teachers Corps and others working in classrooms with disadvantaged youth. Emphasis placed upon actual problems encountered by those enrolled. Reports and discussion based upon surveys and reading will be featured. Prerequisite: consent of instructor.

498-2 to 6 Field Study Abroad. Orientation and study before travel, readings, reports, and planned travel. Includes visits to cultural and educational institutions. Prerequisite: consent of instructor.

506-4 Reading in the Secondary School. For junior and senior high school teachers who desire a foundation in reading. Emphasis placed on the basic skills, appraisal of reading abilities, materials of instruction, and methods of teaching reading in the content areas. Prerequisite: 352 or teaching experience.

507-2 to 4 Readings in Reading. Independent reading; acquaintanceship with the literature and research in reading. Conference periods. Prerequisites: 505 and consent of instructor.

508-4 Current Developments in Selected Subject Areas in Secondary Schools. Problems, issues, and trends in the subject areas of the secondary school.

509-4 to 8 Practicum in Reading. For advanced students; teaching demonstrations and evaluations. Each student works with a group of reading disability cases. Prerequisites: 521a,b,c, and consent of instructor.

510-4 to 8 Seminar: Problems in Reading. Major field content seminar: Problems and practices; comprehensive review and evaluation of research and literature. Each student pursues a problem of his own interest.

514-4 Organization and Administration of Reading Programs. For reading specialists, principals, supervisors, consultants. Recent trends in elementary and high school reading programs, providing reading instruction for total school population, materials and equipment, in-service training, role of the reading specialist. Problems of class members are studied and discussed. Prerequisites: Educational Administration 561, 505.

516-4 to 12 Internship in Reading. Culminating experience for doctoral candidates. Each student supervises reading services in his own or cooperating school. Conference periods. Prerequisites: 521a,b,c, and consent of instructor.

518-2 Supervision of Student Teachers.

521-12 (4,4,4) Diagnosis and Correction of Reading Disabilities. Causes of reading difficulties; observation and interview procedures; standardized tests, instruments, and informal inventories; analysis techniques; experiences in preparing materials for corrective purposes. Each student diagnoses and treats a reading disability case under supervision. Prerequisites: 505 or 440 or concurrent registration with 550, and teaching experience.

525-4 Cooperative Vocational-Technical Education. Taught by agriculture, business, home economics, and technical and industrial educators to prepare teacher-coordinators for work experience programs in the public schools.

560-2 to 12 New Developments in Technological Education. (See Technical and Industrial Education.)

561-4 Curriculum. (Same as Educational Administration and Foundations 560.) Modern practices and procedures in curriculum development, with attention to the professional, social, economic, and other major factors in curriculum planning.

562-4 Secondary School Curriculum. Developments in secondary education. Bases of the curriculum of the secondary school.

564-4 Secondary School Principalship. (See Educational Administration and Foundations 564.)

566-4 Seminar in Instruction. Study and discussion of problems of instruction with attention to experimentation. Prerequisite: consent of instructor.

570-4 Student Activities. Activities of secondary school students. Includes student movements and mores.

571-4 Seminar in Curriculum. Current curriculum issues. Emphasizes the process of curriculum development, evaluation, and implementation in the public school setting. Limited to doctoral students. Prerequisite: 562, Elementary Education 561, or equivalent.

572-4 Seminar: Research and Evaluation in Secondary Education. Critical analysis of evaluation techniques and significant research in organization, learning, teaching, and curriculum in secondary education. Prerequisite: advanced standing and consent of instructor.

575-2 to 4 Individual Research. The selection, investigation, and writing of a research topic, under the personal supervision of a member of the departmental graduate staff, in one of the following areas: (a) Curriculum, (b) Supervision, (c) Language Arts, (d) Science, (e) Reading, (f) Social Studies, (g) Problems in secondary education. (h) Individual research—junior high school methods.

588-4 Social Studies Education. Evaluation of the current professional literature in the curriculum and teaching of secondary school social studies. For improving classroom teaching practices, curriculum design, and in-service programs.

591-4 Workshop in Secondary Education. Designed primarily to help high school principals to work effectively and with the help of resource leadership on the most urgent problems confronting their schools. Prerequisite: consent of instructor.

596-5 to 9 Independent Investigation. A field study required of each student working for the sixth-year professional certificate. The work should be done in the setting of a school system where the student is employed or where full cooperation is extended. Involves selecting a problem, survey of pertinent literature, recording of results, and appropriate interpretations and summarizations.

597-4 Seminar in Proposal Development. For doctoral students. Student prepares proposal for a doctoral level study in the area of Curriculum and Instruction. Provides an opportunity for students to interact in the process of designing, evaluating, and implementing educational studies.

598-12 Practicum. Experience in curriculum construction, evaluation, and implementation. Students placed in local, state, or federal educational institutions and organizations under supervision of a number of the departmental graduate staff and a member of the cooperating institution. Not a substitute for student teaching. Prerequisite: consent of department.

599-3 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Secretarial and Business Education

403-3 Teaching Typewriting. Methods of instruction, skill-building principles and techniques, selection and preparation of instructional materials, review of course content, standards of achievement, and evaluation of pupil performance. Prerequisite: 201c or equivalent.

404-3 Teaching Shorthand and Transcription. Methods of instruction, skill-building principles and techniques, selection and preparation of instructional materials, review of course content, standards of achievement, and evaluation of pupil performance. Prerequisite: 221c or equivalent.

405-3 Teaching General Business Subjects. Development and use of instructional methods and materials, review of course content, and the evaluation of pupil progress in such basic business subjects as general business, consumer education, and business law.

406-4 Teaching Office Practice and Office Machines. Instructional methods and materials for and the evaluation of pupil performance in, office practice, clerical practice, and office machines. Review of course content. Prerequisite: 341 or equivalent.

408-4 Teaching Bookkeeping and Accounting. Teaching procedures, instructional materials, and evaluation of pupil progress in bookkeeping and accounting; instruction and practice in operations taught in high school and community college bookkeeping-accounting classes. Prerequisite: Accounting 251b or equivalent.

409-4 Teaching Distributive Education. For those who plan to become teacher-coordinators of vocational cooperative or in-school distributive education programs. Emphasis on the planning of facilities; selection and review of course content; preparation of instructional materials; organization and arrangement of units; related instruction; simulated block and project plans; and student evaluation. Prerequisite: Marketing 301.

410-4 Teaching Consumer Education. For teaching in secondary schools and junior colleges. Emphasis on meeting state requirements for teachers of consumer education in Illinois. Selection and study of course content; preparation of instructional materials; organization and arrangement of units of study; and planning an evaluation program. Prerequisite: GSB 346, or Finance 305, or equivalent.

411-1 to 6 Workshop in Business Education. Major issues in business teacher education. Offered during one or two weeks of the summer session. Prerequisite: senior standing.

412-4 Teaching Data Processing. Instructional methods and materials for and the evaluation of pupil progress in data processing. Prerequisite: 417 or Data Processing 101a.

414-6 (3,3) Organization and Administration of Cooperative Vocational Business Education Programs. (a) Philosophy and objectives of cooperative vocational programs, methods of selecting students' work stations, and placing and coordinating students in supervised cooperative work stations. (b) Preparation of instructional materials, job analysis, conducting related information classes, evaluating workers and work stations, advisory committees, public relations aspects of cooperative programs. Prerequisite: consent of instructor.

415-6 Supervised Business Experience and Related Study. Prepares teachers and coordinators in accordance with the requirements of the Illinois State plan for the administration of vocational education. Principles and problems of coordinating in-school or cooperative vocational business education programs; supervised occupational experience; classroom analysis and evaluation of on-the-job experiences of the members of the class in relation to their future work as coordinators and vocational teachers. Prerequisite: consent of instructor.

417-4 Applications and Fundamentals of Data Processing in Business Educa-

tion. Acquaints business teachers with data processing applications in high school business classes. Emphasis on vocabulary development, unit record equipment, concepts of programming, and fundamentals of computer applications. Approximately one-third of the course will be spent in machine operation.

426-4 Office Management. Principles of management applied to office problems. Emphasis on the role of the office in business management; office organization; physical facilities and layout of office; office services, procedures, standards, and controls; and records management.

427-4 Records Administration. The value of records, their creation, control, retention, and disposition. Application of principles to such records as medical, legal, educational, industrial, and governmental.

485-3 Principles and Philosophies of Vocational and Technical Education. (See Occupational Education 485.)

500-4 Principles and Problems of Business Education. A study of the fundamentals of business education; its relation to business, to general and vocational education, and to guidance programs; its history, current status, and trends; special emphasis on objectives and curriculum problems.

502-4 Research in Business Education. A study of research findings and techniques as exhibited in representative investigations in business education. Emphasis on reading and interpreting research, using research findings in solving instructional problems, and uncovering potential topics for future research.

503-4 Tests and Measurements in Business Education. The selection, construction, administration, and interpretation of tests and test scores in business education subjects. Principal emphasis on teacher-made tests, especially of the performance type, with secondary attention to published tests in the field.

508-4 Administration and Supervision in Business Education. History and philosophy of administration and supervision in Business Education with consideration of problems arising at local, state, and national levels; and at secondary, college, and university levels. Supervisory problems will include curriculum construction and evaluation, classroom supervision, promotional policies, selection of textbooks, purchase and maintenance of equipment, physical arrangements, and other areas according to need of students.

509-4 Improvement of Instruction in General (Basic) Business Subjects. Designed for the experienced high school teacher who is interested in the study of curriculum and teaching problems in basic business subjects. The course will include teaching procedures, review of materials, formulation of tests and evaluation. The organization of teaching units and projects will be emphasized.

510-4 Improvement of Instruction in Secretarial Subjects. Designed for the experienced high school teacher who is interested in the study of curriculum and teaching problems in secretarial subjects. The course will include teaching procedures, review of materials, formulation of tests and evaluation. Prerequisite: 403 or 404 or 406.

525-4 Cooperative Vocational-Technical Education. (See Occupational Education 525.)

590-1 to 5 Readings in Business Education. Supervised readings in selected subjects. Prerequisite: consent of instructor.

591-2 to 5 Individual Research in Business Education. Selection and investigation of a problem, use of relevant sources and techniques, collection, evaluation, and interpretation of data; and the writing of a report on the investigation. Prerequisite: consent of instructor.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Sociology

406-4 Social Change. Processes of social change in the modern world; culture lag and conflict of norms; individual and social problems arising from conflicting systems of social values and cultural norms. Prerequisite: two sociology courses or consent of instructor.

412-4 Sociological Research. Application of the scientific method to sociological problems. The role of theory. Principles of good research design, measurement, sampling and analysis. Prerequisite: graduate status or consent of instructor.

415-3 Logic of the Social Sciences. (See Philosophy 415.)

424-4 Collective Behavior. The behavior of people in large groups; collective interstimulation and emotions; crowds, audiences, and publics; mass stimuli and mass response. Prerequisite: 321 or consent of instructor.

426-4 Social Factors in Behavior and Personality. How group situations and values affect behavior and shape personality; development of concepts, role-concepts, attitudes, values; theories of motivation; self-concepts; conflicting social values in relation to individual motivation. Prerequisite: 321 or Psychology 305, or consent of instructor.

427-4 Personality and Social Adjustment. Basic mechanisms of adjustive behavior; concepts and criteria of personal integration and social adjustment; varieties of adjustive and non-adjustive behavior; theories of personal organization and disorganization; selected problems. Prerequisite: 321 or Psychology 305 or consent of instructor.

435-4 Social Stratification. A comparative study of social class systems, with emphasis on the American systems. Relationships of class position to behavior in family, religion, politics, etc. Prerequisite: two sociology courses or consent of instructor.

437-4 Sociology of Rural Development. Development in the United States and other countries. Conceptions of "rural," "urban," "developed" and "underdeveloped" considered. Analytic frames of reference for treating these phenomena compared. Prerequisite: two sociology courses or consent of instructor.

438-4 Sociology of Occupations and Professions. Natural history and institutional aspects of occupations in our society, cultural context of occupations in both primitive and modern society, preparation for jobs, human values in work, promotion and discharge, mobility, retirement. Prerequisite: two sociology courses or consent of instructor.

450-4 Social Thought Before 1800. The ideological basis of Western society. The classical foundations. Trends of thought from the Renaissance to the Enlightenment. Prerequisite: two sociology courses or consent of instructor.

451-4 The Sociological Movement. From Romanticism to Realism; rise and development of scientific social thought. Prerequisite: two sociology courses or consent of instructor.

452-4 Black Social Thought. Original works of black writers from the standpoint of problems and prospects of black people in America, and the social context in which these works developed. Relevance of these writings to understanding the current racial situation in the United States considered. Prerequisite: one sociology course and consent of instructor.

453-4 Social Movements. A sociological study of modern social movements; social and cultural backgrounds, forms of expression and organization; social structure of social movements, their role and function in modern society. Prerequisite: two sociology courses or consent of instructor.

454-4 Sociology of Science. Emphasis on the origins and growth of science in historical perspective, reciprocal relations between science and society in the twentieth century, science as a social system, differentiation within and relations between disciplines, and implications of the social organization of scientific research and finding. Prerequisite: two sociology courses or consent of instructor.

460-4 Sociology of Medicine. Man and his adaptation to illness, the sick role, the doctor patient relationship, the organization of medical care and health institutions in the United States, and the role of the sociologist in the health fields. Prerequisite: two sociology courses or consent of instructor.

470c-4 Urban Planning. (See Government 470.)

471-4 Principles of Demography. Techniques in analyzing and evaluating data on human population; composition, birth and death rates, life tables, migration data, estimates of future trend. Practical uses of demographic techniques. Prerequisite: consent of instructor.

472-4 The American Correctional System. (Same as Administration of Justice 472.) A survey of the correctional field covering probation, institutional treatment, and parole: their historic development, organizational structure, program content, and current problems. Prerequisite: 372 or consent of instructor.

473-4 Juvenile Delinquency. (Same as Administration of Justice 473.) Nature of juvenile delinquency; relationship to theories of deviant behavior; efforts at prevention and control. Prerequisite: two sociology courses or consent of instructor.

497-4 Senior Seminar. Issues in sociology and the analysis of these issues. Prerequisite: senior standing with 20 hours in sociology or consent of instructor.

498-8 (4,4) Individual Research. With a faculty member the student arranges a research topic resulting in a paper or report. Prerequisite: senior standing with 20 hours of sociology and consent of instructor.

499-4 Special Projects. The class works in groups or in concert in the development and completion of a theoretical or applied project. Prerequisite: 308, 312, and senior standing with 20 hours of sociology or consent of instructor.

501-4 Survey of Sociological Theory. The development of sociology as a science of society, from synthetic philosophy to analytic sociology. Prerequisite: 451 or consent of instructor.

502-4 Seminar in European Sociological Theory: 1800-1910. The theoretical systems of selected European sociologists studied from the original writings. Prerequisite: 15 hours of sociology or consent of instructor.

503-4 Seminar in European Sociological Theory: 1910 to the Present. A Continuation of 502. Prerequisite: 15 hours of sociology or consent of instructor.

504-4 Seminar in American Sociology. A survey of development of American sociology from its beginnings in the late 19th century to the present. Prerequisite: 501 or consent of instructor.

506-4 Seminar in Contemporary Sociological Theory. An analysis of recent sociological theories, including a survey of current approaches to the construction and application of systematic theoretical models. Special attention will be given to "structural-functional" analysis and to the theoretical adequacy of selected theory-oriented empirical research areas. Prerequisite: 15 hours of sociology or consent of instructor.

512-6 to 7 (4,2 to 3) Sociological Research. (a) Application of the scientific method to sociological problems. The role of theory. Principles of good research design, measurement, sampling and analysis. (b) Under guidance of instructor, students conduct a sociological research project. Must be taken in a,b sequence.

519-4 Methodological Foundations of the Social Sciences. Social science methodology; the nature of social facts and phenomena, the formation of concepts, the application of logic in the social sciences. Prerequisites: 407, and Philosophy 420 or consent of instructor.

521-4 Seminar in Social Psychology. Survey of theoretical systems; progress toward integrated body of behavioral theory. Prerequisite: 426.

522-4 The Sociology of Small Groups. The study of the small group as a small-scale social system. The interrelationship between selected patterned properties of groups such as interaction, emotion, norms, beliefs, values, and myths as the group encounters and attempts to deal with basic problems of group development. Prerequisite: 426 or consent of instructor.

562-12 (4,4,4) Quantitative Methods in Sociology. (a) Linear causal models as a tool in theory and research. Central tendency, variation, covariation, and correlation. Bivariate and multivariate regression models. Path analysis and related techniques. (b) Problems of Measurement. Bivariate and multivariate statistics for nominal and ordinal measures. Linear models of measurement error, reliability and validity. (c) Advanced application of linear models. Models of reciprocal causation feedback and control. The identification problem. Must be taken in a,b,c sequence.

529-4 Sampling and Inference in Social Research. Sampling designs. Sampling distributions. Point and interval estimation. Hypothesis testing: Parametric and nonparametric approaches. Power and efficiency of statistical tests.

530-2 to 4 Selected Topics in Social Research. Problems of design, execution, and analysis of social research. Content varies with interests of instructor and student. May be repeated. Prerequisite: consent of instructor.

532-4 Urban Social Structure. Theories of urban social structure and change, with emphasis on the comparative analysis of ecological and normative processes of integration and disintegration in modern urban communities.

533-4 Ecology of Human Communities. Spatial and temporal organization of population and institutions with special reference to the organization of rural and metropolitan communities. Emphasis on basic research methods and current sources of data in respect to type, structure, and growth of the communities. Prerequisite: 15 hours of sociology or consent of instructor.

534-4 Seminar in Intergroup Relations. Cross-cultural study of inter-ethnic and inter-faith relations, with special attention to conflict, accommodation,

acculturation and assimilation. Prerequisite: 15 hours of sociology or consent of instructor.

537-4 Sociology of Law. An analysis of the role of law in society. Special emphasis will be given to the relationships between law and social organization, social control, social value systems, and social change; consideration will be given to research in the field. Prerequisite: 15 hours of sociology or consent of instructor.

538-4 Seminar in Industrial Sociology. Selected aspects of industrial organization and related problems including such topics as: functional and dysfunctional deviations from ideal bureaucracy, promotion policies, labor relations, job aptitudes, job satisfactions, and public relations. Prerequisites: 15 hours of sociology and consent of instructor.

539-4 Sociology of Bureaucracy. Analysis of the structural characteristics and conditions for the emergence of bureaucratic and quasi-bureaucratic forms of organization. Attention to such problems as the bases of authority, stabilizing mechanisms, systems of formal and informal relations, rationality and paradox in bureaucratic organization; impact of bureaucratic organization upon character structure and its role in the formation of classes and elites. Prerequisites: 15 hours of sociology and consent of instructor.

542-4 Seminar on the Family. The family as a field of sociological study. Assessment of significant historical and contemporary writing. Prerequisite: 15 hours of sociology including 340, or consent of instructor.

543-4 Seminar in Family Variability. An analysis of the structure, organization and function of the family in several contemporary and primitive societies. Prerequisite: 15 hours of sociology including 340, or consent of instructor.

544-4 Seminar in Family Research. A detailed analysis of significant research in the field of the family. Special attention to methods employed as they relate to the specific problems investigated. Prerequisite: 15 hours of sociology including 340, or consent of instructor.

545-4 The Family and Social Change. The significant social factors responsible for changes in the family. Analysis of representative writings from several periods. Prerequisite: 15 hours of sociology including 340 or consent of instructor.

551-4 Seminar in the Sociology of Religion. Analysis of religion in complex societies with comparative consideration of archaic and traditional religious institutions. Emphasis on the problems of secularization, institutionalization, the sociology of knowledge, and social change. Prerequisite: consent of the instructor.

561-4 Alcohol and Society. Analysis of the determinants of ranges of variation in drinking patterns, normal or pathological, viewed cross-culturally and in the context of complex society. Special consideration will be given to the following: the ecology of drinking and alcoholism, drinking patterns and social structure, drinking centered subcultures and institutions, as well as to the genesis and patterning of deviant drinking (alcoholism), responsive movements and systems of control. Prerequisite: consent of instructor.

562-4 Deviance and Disorganization. Comparative study of the role of social, cultural, and psychological factors in the genesis of specific social pathologies exhibiting marked variation in group rates. Pathologies such as suicide, homicide, and alcoholism will be taken as illustrative. The strategic significance of the study of such phenomena for theories of social and personal disorganization will be considered in detail. Prerequisite: consent of instructor.

563-4 Research Problems in Deviance and Disorganization. For students who are concerned to develop viable research projects in the areas of social disorganization and deviant behavior. Students formulate and present original research prospectuses for critical evaluation. Consideration given to questions of theoretical relevance, research design, and appropriate techniques. Prerequisite: consent of instructor.

564-4 Social Factors in Mental Disorders. An examination of the role of social organization and structure in the emergence of mental disorders. Consideration given to pertinent theoretical and research contributions. Prerequisite: consent of instructor.

566-4 Community Organization and Disorganization. Nature of the community and community generating processes. Appraisal of consensus and allocation of power. Illustrative community case studies. Prerequisite: consent of instructor.

572-4 Seminar in Criminology. Critical study of important research and theoretical analyses. Prerequisite: consent of instructor.

591-2 to 6 Individual Research. Supervised research projects. Open only to graduate students with a major in sociology. Prerequisite: consent of instructor and chairman of department. Credit according to achievement.

596-2 to 12 Readings in Sociology. Supervised readings in selected subjects. Prerequisite: consent of instructor and chairman of department.

599-2 to 9 Thesis. Prerequisite: consent of chairman.

600-1 to 48 Dissertation. Prerequisite: consent of chairman.

Special Education

400-4 The Exceptional Child. Physical, mental, emotional, and social traits of all types of exceptional children. Effects of handicaps in learning situations. Methods of differentiation and techniques for rehabilitation. Individual case studies used; observations and field trips. Prerequisite: Psychology 301 or 303 or consent of instructor.

410a-4 Problems and Characteristics of the Emotionally Disturbed Child. Diagnosis, screening, classroom management, placement considerations, goals and the effective use of ancillary services. Emphasis on the understanding of maladaptive behavior through principles of learning and behavior dynamics. Prerequisite: 414 or consent of instructor.

410b-4 Problems and Characteristics of the Mentally Retarded. Objectives, curriculum, methods, and materials of instruction for slow learners. Emphasis upon the principles of learning as they can be applied to this group. Observations. Prerequisite: 414.

410c-4 Problems and Characteristics of the Gifted Child. Designed to help teachers in the identification of and programming for gifted and talented children. Prerequisite: Psychology 301 or 303 or consent of instructor.

410e-4 Problems and Characteristics of Children with Specific Learning Disabilities. Behavioral, emotional, physical, and learning characteristics of children with learning disabilities. Emphasis on receptive and expressive modalities for learning; theories dealing with etiology and treatment. Prerequisite: 414.

411-4 Assessment and Remediation of Learning Disabilities. (Same as Guidance 411.) Theories of special tests and remedial programs designed for children with specific learning disabilities of a perceptual or coordination nature and who may demonstrate related adjustment problems. Prerequisite: 414 and consent of instructor.

413a-4 Directed Observation of Emotionally Disturbed Children. Student observation and participation in group and individual work with emotionally disturbed children. Often taken concurrently with 410a. Prerequisite: consent of instructor.

413b-4 Directed Observation of Mentally Retarded Children. Student observation and participation in group and individual work with mentally retarded children. Prerequisite: 410b or concurrent enrollment, 414, and a major in special education.

420a-4 Methods and Materials for Teaching Emotionally Disturbed Children. Offered in conjunction with practice teaching, dealing with methods and materials needed in teaching emotionally disturbed children.

420b-4 Methods and Materials for Teaching Mentally Retarded Children. Usually offered in conjunction with practice teaching, dealing with methods and materials needed in teaching educable mentally retarded in special education programs. Prerequisite: 410b and consent of instructor.

420e-4 Methods and Materials for Teaching Children with Learning Disabilities. Techniques for implementing educational therapy and remediation of children with learning disabilities. Emphasis on visual, auditory, tactile, and fine and gross motor problems. Prerequisite: 411, 414.

428-4 Speech Correction for the Classroom Teacher. (Same as Speech Pathology and Audiology 428.)

496-2 to 8 Readings and Independent Study in Special Education. Study of a highly specific problem area in the education of exceptional children. Open only to selected seniors and graduate students. Prerequisites: 414 and consent of staff.

501-8 (4,4) Special Research Problem. (a) Research design and methodology

in special education. (b) Development and performance of research study under direction. Prerequisite: consent of department.

513-4 Organization, Administration, and Supervision of Special Classes. Emphasis upon the functions, underlying principles, and cautions to be observed in the organization and administration of special classes. The selection and training of teachers, problems of supervision, special equipment, transportation, cooperating agencies, and legal aspects of the problem. Prerequisite: 414.

515-4 Itinerant Teaching of Exceptional Children. Consultation and interviewing techniques for use with individual exceptional children, their parents, teachers and other school or agency personnel. Methods of individual and small group instruction. Emphasis on itinerant service for emotionally disturbed and hard-of-hearing children through separate concurrently scheduled lectures and demonstrations. Prerequisite: 410a,b, or d.

517-4 The Atypical Child and Social Agencies. A survey of social agencies contributing to the welfare and care of exceptional children. Emphasis given to services rendered and to methods of contact and cost. Visits made to agencies and institutions. Specialists invited to appear before the class. Prerequisite: 414 or consent of instructor.

518-10 to 20 Workshops in Special Education. Promotes better understanding of the psychological and educational problems of children with learning and behavioral disorders. Specialists used as consultants. Open to graduate students majoring in education, guidance, or special education. (a) Education of children with learning and behavioral disorders. (b) Education of mentally retarded children. (c) Education of gifted children. (d) Education of acoustically handicapped children. (s) Administration of special education programs. Prerequisite: 414.

577-4 to 12 Practicum in Special Education. Supervised experience in school or institution programs for atypical children. Special research project. Open to graduate students only. Prerequisites: 410a,b,c, or d and consent of staff.

580a-4 Seminar: Education of Maladjusted Children. Analysis of research, trends, and programs in the education of children who are emotionally disturbed, socially maladjusted, or have learning disabilities. Open to graduate students in special education only. Prerequisites: 414 and consent of instructor.

580b-4 Seminar: Education of Mentally Retarded Children. Analysis of research, trends, and programs in the education of children who are mentally retarded. Open to graduate students in special education only. Prerequisites: 414 and consent of instructor.

590-4 Seminar: Education of Children with Mental Deviations. Critical review of administrative practices, research, theories and etiological factors relevant to programs in the education of children who are mentally retarded or gifted. Implications of research in related disciplines. Application of theories to practice. Open to advanced graduate students in special education only. Prerequisite: consent of instructor.

591-4 Seminar: Education of Physically Handicapped Children. Critical review of administrative practices, research theories and etiological factors relevant to programs in the education of children who are acoustically, visually, or orthopedically handicapped or those who, for medical reasons, must receive homebound instruction. Open to advanced graduate students in special education only. Prerequisite: consent of instructor.

592-4 Seminar: Education of Children with Learning and Behavioral Disorders. Critical review of administration practices, research theories, and etiological factors relevant to programs in the education of children who are emotionally disturbed, socially maladjusted, and/or have specific learning disabilities. Implications of research in related disciplines. Application of theories to practice. Open to advanced graduate students in special education only. Prerequisite: consent of instructor.

596-5 to 9 Independent Investigation. A field study required of each student working for the sixth-year specialists certificate. The work should be done in the setting of a school system where the student is employed or where full cooperation is extended. The study will involve selecting of the problem, surveying of pertinent literature, recording of results, and appropriate interpretations and summaries.

599-2 to 9 Thesis. Minimum of five hours to be counted toward a master's degree.

600-1 to 48 Dissertation.

Speech

General Speech: 408-4, 429-4, 449-4, 450-12 (4,4,4), 520-3, 532-4, 599-2 to 9, 600-3 to 48.

Oral Interpretation of Poetry: 423-4, 424-4, 434-4, 523-3, 599-2 to 9.

Rhetoric and Public Address: 407-8 (4,4), 417-4, 418-4, 425-3, 500-4, 504-3, 505-4, 508-4, 510-4, 524-3, 599-2 to 9.

Speech Education: 406-4, 427-4, 511-3, 525-4, 599-2 to 9.

401-4 Creative Dramatics. (Same as Theater 401.) Materials, techniques, and procedures for conducting sessions in informal drama with emphasis upon its contribution to the total growth and development of the child. Includes lectures, observations, student participation. Prerequisite: junior standing.

406-4 Teaching Speech in Secondary Schools. Philosophy of speech education, and effective teaching of speech through curricular and extra-curricular work. Prerequisite: 16 hours of speech.

407-8 (4,4) History of American Public Address. Critical studies of American speakers; selected speakers and speeches which reflect the dominant social and political ideas in American history. A lecture, reading, and discussion course. Parts may be taken independently.

408-4 Psychology of Speech. Nature and development of speech, its basic psychology, and the part speech plays in personality development.

417-4 Contemporary Public Address. A critical study of speakers and speeches selected to present the characteristic ideas of leading social and political developments in national and international affairs since 1918. A lecture, reading, and discussion course.

418-4 British Public Address. Study of British speakers to c. 1920. Selection of material governed by men and issues that affected British history.

422-4 Oral Interpretation of Prose. The study of the prose form through analysis and performance. Prerequisite: 323, GSC 200, or consent of instructor.

423-4 Oral Interpretation of Poetry. The study of poetic form through analysis and performance. Prerequisite: 323, GSC 200, or consent of instructor.

424-4 Oral Interpretation of Dramatic Literature. The study of dramatic form through analysis and performance. Prerequisite: 323, GSC 200, or consent of instructor.

425-3 Techniques of Discussion Leadership. Group discussion designed to clarify the functions and concepts of the leader in democratic society.

427-4 Secondary School Forensic Program. Coaching and organizational methods for forensic programs in school and college.

428-4 Communication Theories and Models. Survey, analysis, and criticism of contemporary theories and models of human communications with an emphasis on behavioral theories and models.

429-4 Experimental Studies in Oral Communication. Principles of research design accompanied by a critical examination of research in oral communication. Prerequisite: 428.

430-2 to 4 Independent Study. Creative project to be completed in one quarter. Nature of assignment determined by student and instructor and approved by department chairman. Prerequisite: 12 hours speech courses and consent of instructor.

431-2 to 12 Internship or Practicum in Public Relations. Students compete for a professional quarter under the supervision of the director of PR instruction and the PR group of a corporation, institution, agency, or counseling firm. Credit depends upon the demands and complexity of the work which the student performs. Evaluation is a joint function of the group professionals and the director. Prerequisite: 331; Marketing 340; Management 301, 363.

434-4 Group Performance. (a) Group performance media of oral interpretation. Theory and practical application. Prerequisite: 323 or consent of instructor.

(b) Group performance media of oral interpretation with a focus upon children's literature. Prerequisite: 401, Education 413, or consent of instructor.

435-4 Studies in Organizational Communication. Communication systems and behavior within formal organizations. Focused on theory and research of informational and directive communication as related to channels, structures, status, involvement, morale, and leadership. Prerequisite: 303.

441-4 Teaching Speech in Elementary Schools. Study of oral language de-

velopment in children, analysis of their speech needs, and methods of teaching speech in elementary schools with emphasis on speech improvement and development of basic speech skills.

445-12 (4,4,4) Language Behavior. Psycholinguistic approach to the study of language learning and the use of language. Relation of language to other developing behaviors. Applicability of psychological and linguistic theories to social psychological aspects of language communication.

449-4 General Semantics. Means of changing implications so that language, in spoken or written form, describes the life facts.

450-12 (4,4,4) Laboratory in Interpersonal Communication. Communication viewed as a process of relating and evaluating. Applications of and related philosophy, methodology and research to the functioning of the class itself through various speech activities. The course encompasses the common core of communication behaviors relevant to the chief communication specialties.

500-4 Survey of Classical Rhetoric. Ancient rhetoricians and orators from Corax to Augustine, with special emphasis upon the works of Aristotle and Cicero. Lectures and special studies.

501-4 Teaching Oral Language at the Pre-School and Early Elementary Level. For teachers of culturally disadvantaged children. Emphasis on environmentally derived language problems. Theory of language development, relationships between language and learning, and practice in constructing ameliorative language experiences.

504-4 Medieval and Renaissance Rhetoric. An examination of the trends in rhetorical theory between A.D. 100 and 1600 designed to facilitate understanding of the transition from classical to modern theory.

505-4 Modern Rhetorical Theory. An analysis of selected theories of public address from the seventeenth century to the present, with a view of discovering the methods and objectives of modern rhetoricians and relating them to society and its problems during the period.

507-6 (3,3) Studies in Public Address. The study of orators, oratory, issues and movements in terms of implications for rhetorical theory and current concepts of communication. Prerequisite: 407a,b.

508-4 Seminar: Studies in Discussion. Studies in group thinking and group action with a view to improving discussion and conference techniques.

510-4 Seminar: Persuasion and Social Control. Uses and applications of persuasion in the various fields of social activity. Mass media examined as they apply to politics, business, religion, and education.

511-4 (2,2) Teaching the College Speech Course. Problems, methods, and materials in the teaching of speech in college with primary emphasis on the basic course. Examination of textbooks, courses of study, curriculum making, measurement, and relationship to other fields.

520-3 Philosophical Foundations of Speech. A special course reviewing the philosophy of speech for graduate and advanced students. Designed to take advantage of the knowledge and background of distinguished visiting professors.

522-4 to 12 Studies in Interpretation. Historical perspectives, critical methods, contemporary social relationships, modern media experiments, chamber theatre, selected authors, or periods. Course may be repeated for a total of 12 hours. Prerequisite: 12 hours of interpretation or consent of instructor.

523-3 Seminar: Problems in Interpretation. An investigation of the more advanced problems in oral interpretation. Prerequisites: 12 hours in interpretation and theater and consent of instructor.

524-6 (3,3) Problems in Rhetoric and Public Address. Rhetorical theory and criticism of public address examined. Classical and contemporary theory and practice studied.

525-4 Seminar: Speech Education. Problems of philosophy and methods of teaching speech in the elementary and secondary schools. Prerequisite: 306 or consent of instructor.

526-4 Language Behavior Seminar. Problems in language behavior research. Location and development of research topics, formulation of proposals, methods of conducting language behavior research. Prerequisite: 445.

532-4 (2,2) Areas and Techniques of Research in Speech. Study and analysis of outstanding works in the various areas of research. Lectures on research techniques and study possibilities in the field.

540-4 Seminar: Experimental Communications Research. Types of quantitative research and methods of observation and data collection most relevant

to the study of human communication. Prerequisite: 428, 429, and two courses in statistics.

542-4 Seminar in Non-quantitative Research Methods. Survey and critical analysis of non-quantitative approaches to the study of communication, particularly relating to methods of observation, data collection, and interpretation. Emphasis on case and field studies. Prerequisite: 410.

599-2 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

600-1 to 48 Dissertation. Minimum of 36 hours to be earned for the Doctor of Philosophy degree.

Speech Pathology and Audiology

400-1 to 4 Independent Study in Speech Pathology and Audiology. Activities involved shall be investigative, creative, or clinical in character. Must be arranged in advance with instructor. May be repeated for as much as 6 hours of credit.

405-12 (4,4,4) Practicum in Speech and Hearing Therapy. Clinical and school procedures in speech correction and audiology. One hour of class per week, and 2 hours of clinical activity or work on clinically related projects for each hour of credit. (a) Emphasizes therapeutic procedures. (b) Emphasizes diagnostic techniques. (c) Emphasizes the utilization of forms and the preparation of reports. Need not be taken in sequence, but a,b or c cannot be repeated. Prerequisite: junior standing in department.

406-4 Techniques and Interpretation of Hearing Tests. Principles and techniques of testing the hearing and interpreting those tests in terms of the individual's needs. Prerequisite: 416 or consent of instructor.

409-4 The Tactics of Research in Hearing and Speech Pathology. Presentation and evaluation of the strategies and procedural tactics of behavioral research. Prerequisite: advanced standing.

412-4 Cerebral Palsy. An investigation of the etiology, problems, and therapy of cerebral palsy. Prerequisites: 212, 414 or consent of instructor.

414-4 Anatomy and Physiology of Speech and Hearing Mechanisms. (See Physiology 414.)

415-4 Aphasia. An investigation of the etiology, problems, and therapy of aphasia. Prerequisite: 412, 414 or consent of instructor.

416-4 Introduction to Audiology. Provides the student with a basic orientation to the professional field of audiology, its history and its goals. Basic acoustics, the phylogeny, anatomy and physiology of the human ear, and significant pathologies of the ear are presented. Prerequisite: junior standing or consent of instructor.

419-4 Communication Problems of the Deaf and Hard of Hearing. Objectives and techniques for the teaching of lip reading, speech conservation, and auditory training. Prerequisite: 406 or consent of instructor.

420-4 Advanced Clinical Audiometry. Principles and procedures for advanced audiometric testing, advanced problems in bone conduction measurements, in evaluation of loudness recruitment, in topodiagnostic audiometry, and non-organic hearing loss are presented. Practical techniques include speech audiometry, Bekesy audiometry, conditioned pure tone electrodermal audiometry, and use of the Zwislocki Acoustic Bridge. Prerequisites: 416 and 406 or consent of instructor.

428-4 Speech Correction for the Classroom Teacher. (Same as Special Education 428.) Etiology and therapy of common speech defects. May be taken by all inservice teachers, seniors, and graduate students in education.

515-1 to 4 Readings in Speech Pathology and Audiology. Supervised and directed readings in specific areas of speech pathology.

516-4 Seminar in Psychoacoustics. Advanced study of the behavioral response of the human hearing mechanism to the various parameters of the acoustic stimulus; threshold sensitivity, loudness, pitch, localization, modulation, beats and masking. Prerequisites: 406, 416, 520.

520-4 Seminar in Physiological Acoustics. Advanced study of the physiological responses of the middle and inner ear to the acoustic stimulus. Theories of middle ear function and of cochlear function are presented in detail. Prerequisites: 416, 406.

521-1 to 4 Seminar in Articulation and Delayed Speech. Special problems of language development and articulation.

522-4 to 16 (1 to 4 each) Seminar in Organic Speech Problems. (a) Developmental anatomy and physiology. (b) Teratology, surgery, and dentistry. (c) Neuropathological bases. (d) Clinical management. Must be taken in a,b,c,d sequence or by consent of instructor. Prerequisite: graduate standing in department.

524-4 Seminar in Language Disorders. Examination of language disorders associated with childhood. Procedures for the evaluation of aberrant language development in clinical populations in contrast to the linguistic development of normal speakers. Includes study of current psycholinguistic research into factors affecting the acquisition of phonological, syntactical, and morphophonemic rules of English. Practicum in language diagnostics and therapeutics.

528-4 Seminar in Experimental Audiology. Basic psychophysical methods, basic operating principles of electronic equipment, and the use of laboratory sound-production and measurement equipment will be presented. Students will design and perform model psycho-acoustic experimentation. Prerequisites: 520 and 516, or consent of instructor.

529-3 to 12 (1 to 4 each) Seminar in Stuttering Behavior. (a) Emphasizes theoretical analysis, (b) emphasis on diagnostic techniques, (c) application of principles to therapy. Must be taken in a,b,c sequence or by consent of the instructor.

530-1 to 4 Research Problems in Speech Pathology and Audiology. Individual work upon selected problems for research.

531-1 to 4 Seminar in Experimental Phonetics. An investigation into the experimental approaches for the study of the phenomena of speech.

533-1 to 4 Seminar in Speech Science. Special problems in voice science and acoustic perception.

534-1 to 4 Seminar in Instrumentation. Familiarity with instruments, their uses, capabilities, and limitations, as they apply to the study of speech and hearing.

536-1 to 4 Seminar in Administration of Speech and Hearing Programs. A study of program settings, organizational procedures, and professional inter-relationships in adult speech and hearing therapy. Field trips to rehabilitation centers and related agencies.

599-2 to 9 Thesis.

600-1 to 48 Dissertation.

Technical and Industrial Education

(See Occupational Education.)

Theater

400-0 Theater Problems. Group discussion of current problems, productions, and developments in the University theater. Includes lectures, symposiums, production critiques. One hour weekly non-credit course required for 6 quarters for all majors in theater, and for 3 quarters for all theater graduate students.

401-4 Creative Dramatics. (See Speech 401.)

402-8 (4,4) Play Directing. (a) The principles and procedures of play direction including play selection, interpretation, and the patterning of auditory and visual stimuli. (b) Continuation of 402a emphasizing rehearsal procedures, control of tempo and mood, styles of presentation and performance, and other techniques in the direction of plays.

403-4 Aesthetics of the Drama and the Theater. Principles and practice of modern dramatic production in the light of modern aesthetic theory. A course attempting to formulate an aesthetic judgment of the theater.

404-4 Theater Management. Theater operational procedure, including both fundamental structuring and house management. The former aspect includes administration, purchasing, and accounting practices, ticket sales, publicity, promotion, and public relations. The latter covers the management of box-office and ushering.

405-8 (4,4) The Scenic Imagination. (a) A study of the purely creative side of stage production. It includes an analysis of the script and its meaning for an audience; a poetic evaluation of the setting, costumes, and lighting; and the blocking out of the stage action. (b) Theater research and documenta-

tion; an approach to sketches and models; a review of the historic forms of staging, with emphasis on the modern styles from naturalism to epic theater.

407-1 Sound in Theater. Consideration of and practice in the application of sound (incidental music, effects) to dramatic production. Prerequisite: 111a,b.

409-4 High School Theater and Its Production Problems. Consideration of stages, machinery, equipment, light controls and instruments, production techniques, and analysis of basic needs of high school theater.

410-3 Children's Theater. Creative dramatics; dramatization of children's literature; play production for elementary schools. Recommended for education concentrations.

411-4 Playwriting. The writing of a full-length play, a children's play, or a historical pageant-drama forms the basis of the course. Students may elect to write two one-act plays. Individual conferences supplement the class discussion and analysis of student writing. Prerequisite for graduate students: consent of instructor.

412-4 Stage Design. The design of settings for the stage and other dramatic media. Prerequisite: 207.

414-4 Costume Design. History of western costume from Greek to Renaissance and its adaptation to stage use. Theory and principles of theatrical costuming. Application of principles of design and color. Designs for single scenes.

415-4 Costume Design. History of costume, Renaissance through 19th Century. Style, fantasy, and the comic in costume design. Principles of dramatic theory and criticism as applied to costume design. Evaluation of research tools. Methods and procedures in designing costumes for a complete show. Prerequisite: 414.

416-4 Current Theories and Practices in the Teaching of Dance. (See Physical Education 416.)

417-4 Advanced Acting. Lectures, readings, and practical application dealing with advanced studies of characterizations and acting styles on an individual basis. Prerequisite: 217, 317.

432-4 Stage Lighting. Instruments and control equipment; principles and techniques of lighting dramatic productions.

438-4 Contemporary Developments in the Theater. Critical study of theory and practice in acting, directing, production, and architecture in the modern theater. The rise and development of the film, radio, and television as dramatic media.

490-4 to 8 Theater-Television Workshop. (Same as Theater 490.)

502-4 Advanced Directing. Study of and practice in the techniques of directing period plays, verse plays, music dramas, arena productions and other types and styles of plays presenting special directing problems.

503-12 (4,4,4) Advanced Technical Problems. Solutions of problems presented by certain types of plays and modes of production. (a) Scene design. (b) Stage lighting and sound. (c) Costume design. Prerequisite: consent of department.

504-4 The Comic Theater. A study of comedic theory as applied to major types of dramatic composition. Dramatic theories of comedy from Aristotle to Freud are explored. Individual reports.

505-4 The Tragic Theater. An examination of tragic drama and criticism as related to the societies which produced such drama. Particular emphasis is placed upon the Athenian, Elizabethan and modern theater.

506-4 The American Theater. The study of the development of the drama and the theater in the United States from colonial times to the present. Prerequisite: 313 or its equivalent.

519-1 to 12 Theater Practicum. Practical experience in acting, directing, and associated work on campus, on area tours, and in summer stock.

526-3 to 12 Seminar in Theater Arts. Special problems of interest to advanced students. Subject is determined by the instructor. Seminar in same subject cannot be repeated. Prerequisite: consent of department.

530-1 to 4 Research Problems in Theater. Individual work upon selected problems for research.

599-1 to 9 Thesis. Minimum of 5 hours to be counted toward a master's degree.

Zoology

402-4 Natural History of Invertebrates. Observation, identification, and life

- histories. Designed for teachers. Not for students specializing in invertebrate zoology. Prerequisite: 317a.
- 403-4 Natural History of Vertebrates.** Observation, identification, and life histories. Designed for teachers. Not for students specializing in vertebrate zoology. Prerequisite: 317b.
- 404-2 to 12 Zoology Field Studies.** A trip of four to eight weeks to acquaint students with animals in various environments and/or with methods of field study, collection, and preservation. Cost per individual will be approximately \$25 per week. (Only 4 hours may be used for credit.) Prerequisite: consent of department.
- 406-4 Protozoology.** Taxonomy, cytology, reproduction, and physiology of unicellular animals including methods of culturing. Prerequisite: 317a.
- 407-5 Parasitology.** Principles, collection, identification, morphology, life histories, and control measures. Prerequisite: 317a.
- 408-4 Herpetology.** Taxonomic groups, identification, and natural history of amphibians and reptiles. Prerequisite: 317b.
- 409-5 Histology.** Microscopic structure of organs and tissues with emphasis on mammalian forms. Prerequisite: 15 hours biological science.
- 410-5 Vertebrate Paleontology.** History of vertebrate animals in terms of their morphological change, geological succession, and ecological relationships. Prerequisite: 318a or Geology 301.
- 413-10 (5,5) The Lower and Higher Invertebrates.** (a) Structure, phylogeny, and natural history of the lower invertebrates, through lophophorates. (b) Structure, phylogeny, and natural history of the higher invertebrates, protostomes, deuterostomes. Taken in a,b sequence. Prerequisite: 317a.
- 414-4 Fresh-Water Invertebrates.** Taxonomic groups, identification, and natural history of the regional fauna. Prerequisites: 317a.
- 415-4 Limnology.** Lakes and other inland waters, the organisms living in them, and factors affecting these organisms. Prerequisite: 317a.
- 425-4 (2,2) Genetic Methods.** Experimental methods in applying basic principles of genetics. (a) Monogenic and digenic inheritance, sex-linkage, gene interaction, linkage, and chromosome mapping. (b) Mutation, artificial and natural selection, gene frequencies, and genetic drift. Four hours laboratory per week. Must be taken in a,b sequence. Prerequisite: Biology 305.
- 426-4 Comparative Endocrinology.** Comparison of mechanisms influencing hormone release, hormone biosynthesis, and the effects of hormones on target tissues. Includes ablation and histology of glands, and chemical and bioassays with vertebrates and invertebrates. Prerequisite: Biology 308 and consent of instructor.
- 430-8 (4,4) Biological Statistics.** (a) Examination of distributions, the parametric statistics and simple regression theory. (b) Examination of experimental design, the analysis of variance, and the analysis of covariance. Prerequisite: consent of instructor.
- 441-4 Emergence of Order in Biological Systems.** From molecular to the gross morphological level: cybernetic, systemic, thermodynamic, and evolutionary aspects. Prerequisite: 300 and one course in cellular physiology or consent of instructor.
- 459-4 Game Birds.** Identification, life history, ecology, and management. Cost of field trips up to \$15 per student. Prerequisite: 317a and b or consent of instructor.
- 461-4 Mammalogy.** Taxonomic groups, identification, and natural history of mammals. Prerequisite: 317b.
- 463-4 Wildlife Management.** The principles and varied techniques of managing wildlife resources. Cost of field trips up to \$15 per student. Prerequisite: 15 hours of biological science or consent of instructor.
- 465-4 Ichthyology.** Taxonomic groups, identification, and natural history of fishes. Prerequisite: 317b.
- 466-4 Fish Management.** Sampling, dynamics, and manipulation of fish populations, age and growth of fishes, and habitat improvement. Prerequisites: one year of biological science, consent of instructor.
- 467-4 Ornithology.** Classification and recognition of birds and the study of their songs, nests, migratory habits, and other behavior. Cost of field trips is \$5 to \$10 per student. Two lectures and 4 laboratory hours per week. Prerequisite: 317b.
- 471-4 Entomology.** Structure, classification, and life histories of insects. Two lectures and 4 laboratory hours per week. Prerequisite: 317a.

- 479-4 Animal Behavior.** (Same as Animal Industries 479 and Psychology 479.) The biological basis for the actions and responses of animals. Prerequisite: GSA 301, or 302, or equivalent.
- 581-3 The Zoological Literature.** Diversity and functions of Zoological literature, scientific writing, and the publication process. Prerequisite: graduate status in a biological science.
- 508-4 Helminthology.** Identification, structure, physiology, and life history of parasitic worms. Prerequisite: consent of instructor.
- 512-3 Animal Geography.** Principles of the distribution of the animals of the world. Prerequisite: consent of instructor.
- 514-4 Advanced Entomology.** Morphology, physiology, systematics, and distribution of insects. Prerequisite: 471.
- 520-5 Advanced Invertebrates.** The nature and life of invertebrate animals with emphasis on comparative form, function, behavior, and occurrence. Prerequisite: consent of instructor.
- 521-4 Advanced Limnology.** The physical, chemical, and biological factors affecting organisms in streams. Emphasis on the effects of pollution. Prerequisite: 415 and consent of instructor.
- 525-5 Cytology.** (Same as Botany 525.) Microscopic study of protoplasm, including mitosis and meiosis; discussions of cytological behavior. Prerequisite: consent of instructor.
- 540-3 Factors in Animal Reproduction.** Genetic and physiological factors in determination, differentiation, and modification of sex in animals. Prerequisite: consent of instructor.
- 542-3 Osteology.** Modification of the vertebrate skeleton as a result of growth, functional adaptation, and phylogenetic relationship. Prerequisite: consent of instructor.
- 561-4 Game Mammals.** Natural history and management. Prerequisite: consent of instructor.
- 566-4 Fish Culture.** Production of game, food, and bait fishes. Design of facilities, chemical and biological variables, spawning techniques, diseases and nutrition. Prerequisite: consent of instructor.
- 573-4 Physiological Ecology.** Physiologic and morphologic adaptations and homeokinetic mechanisms in the ecology of organisms. Prerequisite: Biology 307 or equivalent and consent of instructor.
- 577-3 Population Ecology.** Principles of population dynamics as related to animals. Prerequisite: consent of instructor.
- 578-4 Population Genetics.** Genetic structure of populations, factors causing changes, and principles governing rate and direction of change. Prerequisite: consent of instructor.
- 580-4 Advanced Systematics.** The implication of systematics, including the theory and dynamics of classification, speciation, population genetics, and evolution. Prerequisite: consent of instructor.
- 581-3 The Zoological Literature.** Diversity and functions of zoological literature, scientific writing, and the publication process. Prerequisite: graduate status in a biological science.
- 582-6 (1,1,1,1,1) Graduate Zoology Seminar.** Special topics in zoology. Consult department for each term's topic.
- 583-3 (1,1,1) The Teaching of Zoology in College.** Methods, practices, and objectives in teaching zoology. Designed as part of the apprenticeship program for preparation of college teachers. Prerequisite: graduate status in a biological science.
- 585-9 to 27 (Each Section 1 to 3) Seminar.** (a) Seminar in animal behavior. (b) Seminar in developmental biology. (c) Seminar in ecosystems. (d) Seminar in wetland ecology. (e) Seminar in wildlife ecology. (f) Seminar in ornithology. (g) Seminar in parasitology. (h) Seminar on the amphibia. (j) Seminar in invertebrate zoology. Prerequisite: consent of instructor.
- 596-1 to 12 Special Research.** Investigations in zoology other than those for theses. Only 3 hours may be credited toward a degree. Prerequisite: consent of instructor.
- 599-1 to 12 Research and Thesis.** For master's degree.
- 600-1 to 48 Research and Dissertation.** For Doctor of Philosophy degree.

4 / Faculty

Graduate instruction at Southern Illinois University is the responsibility of the faculty. Although the Graduate Faculty is not organized into departments, its members are normally affiliated with specific disciplines.

Preceding the Graduate Faculty is a list of faculty members elected to the Graduate Council for the year 1971–1972.

The Graduate Council

Ian Beattie, Assistant Professor
George G. Brown, Associate Professor
Lincoln Canfield, Professor
John Cody, Professor
David Ehrenfreund, Professor
Neal Foland, Professor
Herman Gaas, Professor
William Herr, Professor
Charles Hindersman, Professor
John Holmes, Graduate Student
Marvin Johnson, Professor
Frank Konishi, Professor
Herman Lantz, Professor
Keith Leasure, Professor
Gary Marr, Graduate Student
Lawrence Matten, Associate Professor
Christian Moe, Professor
Robert Mueller, Professor
Lydia Pulsipher, Graduate Student
Geoff Sainty, Graduate Student
Lon Shelby, Associate Professor
Dean Stuck, Associate Professor
Richard Thomas, Associate Professor
John Zimmerman, Professor

College of Liberal Arts and Sciences

Anthropology

Professors Philip J. C. Dark Jr., Charles Kelley, Robert L. Rands, Carroll L. Riley, Walter W. Taylor
Associate Professors Milton Altschuler, Edwin A. Cook (*Acting Chairman*), Jerome S. Handler, Joel M. Maring, Bruce B. MacLachlan, Jon D. Muller
Assistant Professors Marvin L. Bender, J. Larry Grimes, Ester G. Maring, Malcolm T. Walker

Botany

Professors William C. Ashby, Robert H. Mohlenbrock, L. V. Olah, Aristotel J. Pappelis, Jacob Verduin, John W. Voigt
Associate Professors Margaret Kaeiser, Lawrence Matten, Walter E. Schmid, Donald R. Tindall (*Acting Chairman*), Oval Myers
Assistant Professors Donald Ugent, Philip A. Robertson, John Yopp

Chemistry

Professors Richard T. Arnold (*Chairman*), Roger E. Beyler, James BeMiller, George E. Brown, Elbert H. Hadley, Herbert J. Hall, Cal Y. Meyers, Wilbur N. Moulton, Boris Musulin, Charles D. Schmulback, Russell F. Trimble, John Wotiz

Associate Professors Albert L. Caskey, Herbert Hadler, Jr., Conrad Hinckley, D. F. Koster, Donald W. Slocum, Gerard V. Smith

Assistant Professors D. Wayne Bolen, James Cox, Michael R. Emptage, William E. Geiger, H. F. Gibbard, Michael T. Sung, James Tyrell

Computer Science

Professor Abraham Mark (*Chairman*)

Assistant Professors Kenneth Danhof, Ratan Guha

English

Research Professor Harry T. Moore

Professors James Benziger, Ted R. Boyle, Edmund Epstein, William H. Evans, Joseph Friend, John Gardner, Mark Hillegas, Sidney P. Moss, Robert B. Partlow, Henry Dan Piper, Howard Schultz, William E. Simeone, E. Earle Stibitz, Charles Tenney, David Vieth, Howard W. Webb, Jr. (*Chairman*)

Associate Professors Bruce Appleby, Alan Cohn, Robert Griffin, John Howell, Paul Hurley, Richard Lawson, Paul H. Morrill, Raymond S. Rainbow, Byron Raizis, Manuel Schonhorn, Larry E. Taylor

Assistant Professors Roderic Botts, William J. Brown, Herbert Donow, Jewell A. Friend, George Goodin, Thomas Hatton, David Kvernes, Richard Peterson, Hans Rudnick

Foreign Languages

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Associate Professors Vernon L. Anderson, Howard French, James Kilker, Helmut Liedloff

Assistant Professors Steven L. Hartman, Warren L. Meinhardt, Joan V. O'Brien, Maurice O'Meara, Olga Orechwa, Guenter Pfister, Igor Shankvosky, Marie-Jose Southworth, James Tai, Charles Speck, Maxine Vogely

Visiting Professors Jenaro Artiles, Ching-ho Chen, Nguyen K. Hoach

Geography

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Instructor Paul D. Robinson

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Assistant Professors Harry Jacobson, Bruce Swinburne, Elwyn Zimmerman

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Physical Education for Men

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Associate Professors Ronald G. Knowlton, John Stotlar, James J. Wilkinson
Assistant Professors Kenneth Ackerman, Peter Carroll, C. C. Franklin, Larry Good

Physical Education for Women

Professors Dorothy Davies, Helen Zimmerman
Associate Professors Marjorie Bond Potter, JoAnne Thorpe (*Chairman*), Charlotte West
Assistant Professors Winston G. Gray, Elleva Davidson Sook

Recreation

Professor William H. Freeberg
Associate Professors William E. O'Brien (*Chairman*), Loren Taylor
Assistant Professor Paul Nowak

Secondary Education

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Assistant Professors Roderic C. Boots, Raymond DeJarnett, Helen James, Harry Miller

Special Education

Professors James Crouner, Kristen Juul
Associate Professors Lee Joiner, Howard Morgan (*Chairman*), Wyatt Stephens
Assistant Professor John Jacobs
Lecturer Dan Rainey

School of Agriculture

Agricultural Industries

Professors Ralph A. Benton, William McD. Herr, Wendell Keepper, Walter Wills (*Chairman*), Eugene S. Wood
Associate Professors J. J. Paterson, Lyle Solverson, Thomas Stitt
Assistant Professors Donald L. Ahrens, Gordon Honegger, Gordon Langford, Donald Lybecker

Animal Industries

Professors Billy L. Goodman, Scott W. Hinnens, G. B. Marion (*Chairman*), Howard H. Olson
Associate Professors Warren S. Bivin, Harold H. Hodson, Jr., W. G. Kamm-lade, Jr., Gilbert H. Kroening
Assistant Professors Carl L. Hausler, D. Dixon Lee, Jr., Louis E. Strack, George H. Waring

Forestry

Professors John W. Andresen (*Chairman*), Paul A. Yambert
Associate Professors Margaret Kaeiser, Dwight R. McCurdy, Ali A. Moslemi
Assistant Professors Carl A. Budelsky, Raymond S. Ferell, James S. Fralish, Paul L. Roth

Adjunct Professors Arthur G. Chapman, Peter Chen, Eugene Landt, Craig K. Losche, Howard N. Rosen, L. A. Mehrhoff, Gerald Gaffney, Robert E. Phares

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