BULLETIN OF

The Graduate School

1968-69

SOUTH DAKOTA STATE UNIVERSITY, BROOKINGS, SOUTH DAKOTA 57006

E SCHOOL CALENDAR FOR 1968-69

1968 SUMMER SESSION

June 5, Wed.—Registration

June 6, Thurs.—Beginning of classes

July 4, Thurs.—Independence Day, a holiday

July 5, Fri.—No classes

July 8, Mon.—Theses due, Graduate office

July 22, Mon.—Last day, final oral examinations

July 29, Mon.—Corrected theses due, Graduate Office

Aug. 2, Fri.—Summer Session closes

Aug. 3, Sat.—Graduation at 10:00 a.m.

1968 FIRST SEMESTER

Sept. 11-12, Wed., Thurs.—Registration

Sept. 13, Fri.—Beginning of Classes

Sept. 30, Mon.—Last day to register or add a course

Oct. 12, Sat.—Hobo Day

Oct. 14, Mon.—No Classes

Oct. 15, Tues.—Last day for submitting graduation cards

Nov. 11, Mon.—Veterans' Day, a holiday

Nov. 20, Wed.—Last day a course may be dropped without penalty

Nov. 27, Wed.—Classes close at 12:30 p.m. for Thanksgiving

Dec. 1, Mon.—Classes resume

Dec. 20, Fri.—Classes close at 5:30 p.m., for Christmas recess

1969

Jan. 6, Mon.—Classes resume

Jan. 6, Mon.—Theses due, Graduate Office

Jan. 13, Mon.—Last day, final oral examinations

Jan. 17, Fri.—Corrected theses due, Graduate Office

Jan. 17, 18, 20, 21, 22, Fri., Sat., Mon., Tues., Wed.—Semester examinations

Jan. 22, Wed.—Semester closes

Jan. 25, Sat.—Graduation exercises

1969 SECOND SEMESTER

Jan. 27-28, Mon., Tues.—Registration

Jan. 29, Wed.—Beginning of classes

Feb. 14, Fri.—Last day for registration for a course

Mar. 3, Mon.—Last day for submitting graduation cards

Mar. 31, Mon.—Last day a course may be dropped without penalty

Apr. 2, Wed.—Last day of classes—Easter recess

Apr. 8, Tues.—Classes resume

May 8, Thur.—Theses due, Graduate Office

May 20, Tues.—Last day, final oral examinations

May 22, 23, 24, 26, 27, 28, 29, Thurs. p.m., Fri., Sat., Mon., Tues., Wed. Thurs. a.m.—Semester examinations

May 23, Fri.—Corrected these due, Graduate Office

May 29, Thurs.—Semester Closes

June 1, Sun.—Eighty-third annual commencement

1969 SUMMER SESSION

June 4, Wed.—Registration

June 5, Thurs.—Beginning of Classes

July 4, Fri.—Independence Day, a holiday

July 7, Mon.—Theses due, Graduate Office

July 21, Mon.—Last day, final oral examination

July 28, Mon.—Corrected theses due, Graduate Office

Aug. 1, Fri.—Summer Session closes

Aug. 2, Sat.—Graduation at 10:00 a.m.

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THE GRADUATE BULLETIN

South Dakota State University—Brookings, South Dakota

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The Graduate School

GENERAL INFORMATION

An act of the Territorial Legislature, approved in 1881, provided for the establishment of what is now South Dakota State University. The institution granted its first Master of Science degree in 1891, its first Master of Education degree and its first Doctor of Philosophy degree in 1958. All graduate work was supervised by a committee until 1957, when the Graduate School was established.

A Graduate Council having seven members elected from the Graduate Faculty assists the Dean and Associate Dean in the administration of the affairs of the school. This council is composed as follows: The Graduate Dean (chairman); the Associate Dean (Secretary); two members from the area of biological science; two members from the area of physical science; two members from the area of social science; and one member from the area of education. In addition the Director of the Library serves as an ex officio member.

The Graduate Faculty is composed of the University president, dean of academic affairs, college deans, heads of departments in which graduate courses are given and other faculty members chosen, on the basis of their training and experience, in accordance with the policies of the Graduate School. All matters of policy and standards are acted on by the Graduate Faculty. In addition, Graduate Faculty members are authorized to serve as advisers to graduate students or on their examining committees and to teach courses for graduate credit.

This bulletin deals only with the graduate programs of the institution. For descriptive material regarding undergraduate programs and for general information concerning South Dakota State University, refer to the General Catalog issued by the Office of Admissions and Records. Information concerning summer school programs is published in the Summer Session Bulletin which may be obtained from the Graduate Office or from the Office of Admissions and Records.

ACCREDITATION

The graduate program of South Dakota State University is accredited through the Doctoral degree by the North Central Association of Colleges and Secondary Schools, the regional accrediting agency for nineteen states including South Dakota. The Graduate School is a member of the Council of Graduate Schools in the United States and subscribes to the policies of this organization.

The departments of Agricultural, Civil, Electrical, and Mechanical Engineering, and Engineering Physics are accredited by the Engineers Council for Professional Development.

The curriculum in Journalism is accredited by the American Council on Education for Journalism.

The Chemistry Department is accredited by the American Chemical Society.

Preparation of secondary teachers, administrators and guidance counselors at the graduate level is accredited by the National Council for Accreditation of Teacher Education.

The curriculum in Pharmacy is accredited by the American Council on Pharmaceutical Education.

The University also holds membership in the American Council on Education, the National Education Association of Colleges of Pharmacy, the American Society for Engineering Education, The Association of Accredited Schools and Departments of Journalism, the American Library Association, the National Commission on Accrediting Agencies and the American Chemical Society.

ADMISSION TO THE GRADUATE SCHOOL

All students taking work beyond the Bachelor's degree, whether or not they intend to work for an advanced degree, are classified as graduate students. Before enrolling in any course, they must have been admitted to the Graduate School. (The exception to this is the case where a student with a Bachelor's degree enters school to work toward an additional Bachelors degree. In this case, admission is obtained through the Office of Admissions and Records.)

To make application, a form supplied by the Graduate Office must be submitted to that office 15 days prior to the opening of the term in which the applicant first expects to enroll as a graduate student. With the application, the following must be provided:

1. One official transcript of undergraduate coursework. This applies to graduates of South Dakota State University as well as to graduates of other institutions. However, South Dakota State University graduates who do not intend to work toward an advanced degree need not furnish a transcript. If some graduate work has been taken at another institution, one official transcript must be supplied for this also, even though the applicant may not wish to apply some of this work toward a degree here. For those making application prior to obtaining their Bachelor's degree, an incomplete transcript will be filed with the application. A completed transcript must then be filed during the first term in which the student takes graduate work.
2. An application fee of $10, except former South Dakota State University students.
3. A report of physical examination. This is required of all students except those taking Extension and evening classes.
4. Two letters of recommendation from persons acquainted with the applicant. These letters on forms supplied by the Graduate Office should be sent directly to the Graduate Office by the person writing them.
5. In addition to the above, students from foreign countries must also send the following with their applications:
   a. A statement as to whether financial assistance will be required from this institution.
   b. The results of the Test of English as a Foreign Language (TOEFL). In addition, all foreign students will be required to attend an English proficiency Seminar during the Summer Session prior to enrollment or during the semester in which they enroll.

   Note: Students from foreign countries should file their applications at least **four months** in advance of the beginning of the first term in which they expect to register.

After an application for admission and supporting documents are received, they are reviewed by the department concerned. Using the recommendations from the department, the Associate Dean of the Graduate School acts on the application. He then notifies the applicant, the department or committee concerned, the Dean of Student Personnel and the Office of Admissions and Records of his decision.

Admission to the Graduate School requires that the applicant be a graduate of or a candidate for a degree from an institution of higher learning. The institution must be one of recognized standing, whose requirements are substantially the same as those of the department(s) of South Dakota State University in which the advanced degree will be taken. Other requirements and conditions are given below.

Admission Without Conditions

To be admitted without conditions, the applicant must have already earned the Bachelor's degree, must have satisfactorily completed all undergraduate prerequisites for the major and minor fields of study, and must have an average grade of "B" (3.0) based on A=4, B=3, C=2, D=1) or better for the last two academic years of undergraduate work for which grades are submitted. Consideration also may be given to the G.P.A. for subsequent graduate work.

Provisional Admission

Provisional admission may be granted if:

1. The applicant has a 3.0 or higher grade point average for the last 3 semesters but has not completed the last semester of his senior year of undergraduate study. In such cases admission is provisional until the Bachelor's degree is granted.
2. The applicant lacks prerequisite undergraduate courses specified by the major department. Admission is provisional until these courses have been satisfactorily completed.
3. The applicant has a low grade point average between "C+" (2.25) and "B" (3.0) for his Junior-Senior years. Admission is provisional until the student has completed 10 hours of graduate work with a grade point average of 3.0 or better.

It should be noted that a student admitted provisionally must remove the provisions as soon as possible. He may not file a plan of study until granted unconditional admission. Departments will assign advisors to such students.

Nondegree Admission

Students not wishing to work toward a degree for any reason may be granted admission and take courses as nondegree students. The Associate Dean will act as advisor to these students. Any change in this status will have to be approved by the department concerned and the Associate Dean.

Readmission

Students formerly enrolled as graduate students at South Dakota State University must apply for readmission at least one month prior to registration. Forms for this purpose should be obtained from the Graduate School.

Official transcripts for graduate work taken at other institutions since enrollment must be furnished at this time.

It may be desirable to arrange for a personal interview with the Head of the major department prior to registration.

Graduate Record Examination

Submission of the results of a Graduate Record Examination is not a requirement for admission by the Graduate School. However, any department may impose such a requirement, either prior to admission or during the time graduate work is being conducted.

Graduate Credit for Seniors

Seniors within 15 credits of completing their Bachelor's degree at South Dakota State University may request permission from the Associate Dean of the Graduate School to take 600 and 700 level courses for graduate credit. Such permission requires that the student have a grade point average for all undergraduate work of 2.5 or better, not enroll for more than 18 credits (9 credits during summer school) of coursework, and the course or courses are not required for the Bachelor's degree. Forms for requesting permisssion to take courses for graduate credit should be obtained from the Graduate Office.

Graduate Study by University Staff

Full-time members of the research, instructional, or extension staffs may enroll for up to 7 credits of course work per semester. Two credits may be carried during the Summer Session. However, not more than 12 credits may be carried during the calendar year.

Permission to enroll in coursework must be obtained from the head of the department, Dean of the College, and the President. The proper form, obtained from the President's office, should be completed and presented to the Office of Admissions and Records when registering. Staff members, wishing to take courses but not working toward a degree at this institution, should obtain and complete a permit to register form (available at the Graduate Office). Staff members (below rank of Assistant Professor) intending to work toward a degree at this institution must complete the usual graduate school application form (available at the Graduate Office).

Staff members above the rank of instructor, including courtesy appointments, may not work toward an advanced degree at this institution.

Departmental Requirements

Individual departments may impose additional admission requirements to their department. Inquiry should be directed to the department in which you are interested concerning such requirements. Applicants for a graduate degree in **guidance and counseling,** for example, must meet the following additional requirements:

1. Hold a personal interview with the supervisor of counselor education. He may require the applicant to meet with a board prior to approving the request for admission. Such a board would include staff members from guidance and counseling, education and the applicant's supporting field.
2. Two letters of recommendation (on forms supplied by the Graduate School) supporting the application must be from immediate past employers, supervisors, or administrators.

3. Evidence of satisfactory physical and mental health as determined by the director of student health services at South Dakota State University.

In addition former and continuing students in the guidance and counseling program also may be required to present adequate evidence of satisfactory physical and mental health prior to readmission or continuation of the program.

Post Doctoral Study

Post-doctoral students or eminent scholars who desire temporarily the privileges of the research facilities, staff counsel, library or seminars at the institution and who are not candidates for a degree, may pursue study upon recommendation of the head of the department and Dean and/or Director concerned and approval of the Dean of the Graduate School and the President.

REGISTRATION

Details of the procedure for registering are printed in the semester schedule available to students prior to each registration. Graduate students report to the Graduate Office as the first step of their registration, at which time they receive further instructions.

Normal and Maximum Credit Loads

The normal credit load per semester during the academic year is 15 credits for the full-time student. During the four week summer session the load is 4 credits. During the eight week summer session it is 8 credits (maximum of 9). Workshops are included in these normal and maximum loads.

The maximum credit load for graduate assistants is as follows:

	Maximum credits student may carry during the:	
	Academic Year	Summer Session
One-fourth time assistant	30	5
One-half time assistant	22	3
Three-fourths time assistant	15	3

In calculating credit loads, audit courses are included at full value. Undergraduate courses are also included at full value.

TUITION AND FEES

Academic year:

Application fee (new students only)	$10.00
Matriculation fee (new students only)	5.00
*Tuition per credit hour (residents)	9.50
*Tuition per credit hour (non-residents)	25.00
General University fee per semester. Includes laboratory fees, health fee, Student Union fee, and fees for other services. Union fee ($10.50) optional for graduate assistants on contract	23.00
Student Association fee per semester (optional for graduate assistants on contract)	16.70
Full-time graduate students, or part-time graduate students resident on campus, who have completed course and thesis requirements but who are working to complete their theses or dissertations, South Dakota or non-South Dakota residents, per semester	75.00
Students in this category may register for one course as an auditor without charge.	
Sustaining thesis fee:	
For master's candidates, per semester	25.00
For Ph.D. candidates, per semester	50.00
Extension courses: Tuition per credit hour	16.00

*Graduate Assistants, Fellows and Trainees on contract with the University pay one-third the resident tuition per credit and their Dependents are eligible for resident tuition.

Summer Sessions:

The same fees apply to Summer Session except the General University fee is $1.25 per credit with a minimum of $3.50, and the Student Association fee is $4.00.

Other Fees:

Late registration fee: A late registration fee of $10.00 is charged all students who enroll and pay their registration costs after the time announced for that purpose.

Fees for auditing courses: The audit fee is $9.50 per credit for residents and $25.00 per credit for non-residents. The audit fee will be waived for all personnel on University contract. Registration as an auditor requires the consent of the department concerned. Such registration carries permission to listen only, and no examinations or credit are given.

Additional Fees for Graduate Students

Before the thesis for the Master of Arts, Master of Science or the Doctor of Philosophy degree is presented to the Graduate Office in final form, a $5.00 payment must be made to cover in part the cost of binding the two library copies.

Before the Doctor of Philosophy degree is granted the candidate must pay a fee of $25.00 to cover the cost of microfilming the thesis and publishing the abstract in "Microfilm Abstracts."

Sustaining thesis fee. Noncampus students who have completed all course requirements and the required registration for thesis or dissertation, but who have not completed the thesis or dissertation, must register for "0" credits for each semester (but not the Summer Session) until the thesis has been submitted to the Graduate Office. This registration may be done by mail. Students may be granted leaves-of-absence by the Dean of the Graduate School for strong and unusual reasons (such as extended illness or military service) and for limited periods of time.

The sustaining fee is to partially cover the costs of faculty correspondence and consultation in the thesis preparation and the costs of maintaining records and contact with the candidate.

FINANCIAL AND OTHER INFORMATION

Fellowships and Assistantships

A number of fellowships, research and teaching assistantships are available to well qualified graduate students at this institution. However, recommendations for granting these are handled by the individual departments. Students interested in obtaining such financial assistance should write directly to the department in which they expect to do their major work.

Housing for Graduate Students

Prospective men graduate students should inquire about rooms or apartments of the Director of Student Housing, South Dakota State University, well in advance of registration. Single women should inquire of the Dean of Women.

Living Costs

Living costs, including tuition and fees, for the typical single graduate student are estimated to be $1,800.00 to $2,200.00 per academic year of nine months. Travel costs are not included.

Graduate Courses During the Summer Sessions

Many departments offer graduate courses during the summer. For information concerning the courses to be offered, write the Office of Admissions and Records or the Graduate Office and request a Summer Session Bulletin.

Credit Restrictions for Workshops

While any number of credits may be earned in workshops, no more than 2 such credits may be applied toward an advanced degree.

Credit Restriction for Problems Courses

No more than 4 credits in problems courses may be counted toward the completion of the Master of Arts, Master of Science or Master of Education degree program. No

more than 6 credits of problems courses (beyond the Bachelor's degree) may be counted toward the completion of the Doctor of Philosophy degree program.

Correspondence Courses

Correspondence courses are not given at the graduate level at this institution. Neither is transfer credit allowed for correspondence courses taken elsewhere.

Grades for Thesis

While graduate students usually register for thesis credits during several semesters, no grade is given in thesis until after the final oral examination. Thesis advisers give an incomplete grade (I) each term in which the student enrolls for thesis credits. After completion of the final oral examination, the thesis adviser gives **one grade** for all thesis credits by the usual method of notifying the Office of Admissions and Records of the removal of the incomplete grade.

Filing a Graduation Card

Not later than four weeks after registration day for the term at the end of which a student expects to receive the advanced degree, a graduation card must be filed by the student with the Graduate Office. Failure to file this card will result in a delay in granting of the degree.

Scholastic Requirements

No credit is given toward a graduate degree for any course for which the grade is below "C." In addition, all work in the major must average "B" (3.0) or better, and all work in the minor or in supporting courses must average "B" (3.0) or better. Grades for transfer courses are not used in calculating these grade point averages.

In addition to the above a graduate student must have a "B" (3.0) average in all graduate and converted credit courses taken at South Dakota State University.

Cap, Gown, and Hood Rental

Caps, gowns, and hoods for Commencement may be rented from the Student Association Bookstore located in the Student Union building.

Attendance at Commencement

All students to be granted the Master's or Doctor's degree are expected to participate in the Commencement exercises at which the degree is to be granted. Failure to attend will mean a delay in awarding the degree until a later Commencement exercise. In cases where attendance will require excessive expenditure for travel, or for some other good reason, the President may authorize an absence, and the degree will be granted. Such authorization will be given only upon letter of request from the candidate to the President fully explaining the need for being absent. The President will notify the candidate if the request is approved.

Degrees and Fields of Study

South Dakota State University offers the Master of Science, the Master of Arts, the Master of Education, and the Doctor of Philosophy degree in many fields or areas. The general description and the requirements for these degrees are given below. The student who wishes to become a candidate for an advanced degree must not only fulfill these requirements but meet those of the major and minor departments as well.

THE MASTER OF ARTS AND MASTER OF SCIENCE DEGREES

The Master of Science degree is offered with the following majors:

Agricultural Economics
Agricultural Education
Agricultural Engineering
Agronomy
Animal Science
Bacteriology
Botany
Chemistry
Child Development and Family Relations
Civil Engineering
Dairy Science
Economics
Education
Electrical Engineering
Entomology
Guidance and Counseling

Home Economics
Home Economics Education
Horticulture
Industrial Economics
Journalism
Mathematics
Mechanical Engineering
Nutrition and Food Science
Pharmaceutical Chemistry
Pharmacognosy
Pharmacology
Pharmacy
Physical Education
Physics
Plant Pathology
Poultry Science
Printing Management
Rural Sociology
Textiles and Clothing
Wildlife Biology
Zoology

The major fields shown above may also be selected as minor fields. In addition, History, Political Science or Mechanized Agriculture (Agricultural Engineering department) may be chosen as a minor.

The Master of Arts degree is offered with the following majors:

Economics
English
Journalism
Sociology
Speech

The Major fields listed above may also be selected as minor fields.

The Advisers

Each student in the Master's degree program will choose a major adviser through consultation with the head of the department in which the major is being taken. The major adviser is required to be a member of the graduate faculty. A minor adviser is also chosen when a minor field is elected. The major adviser should be chosen prior to registration for the first semester of work, and the minor adviser as soon thereafter as possible.

Residence and Credit Requirements

A minimum of 30 graduate credits beyond the Bachelor's degree is required for the Master of Arts and the Master of Science degree. The minimum residence requirement for this degree is 20 graduate credits. Residence credit is given only for graduate credit earned in courses offered by South Dakota State University.

Outdating of Coursework

Courses taken more than 6 years prior to completion of the Master's degree are considered outdated. Credit for courses taken more than 6 years previously may be used in a Master's degree program if the course is repeated or if approved by the Graduate Council. Approval by the Graduate Council requires a letter from the instructor of the course certifying that the student has been examined by him and found competent at this time in the subject matter of the course. The rules of the Graduate School in effect at the beginning of the seventh year following admission of the student to work toward the Master's degree will apply if the degree has not been granted by then.

Requirements for the Major

A minimum of 19 credits out of the 30 required for a Master's degree must be earned in the major. The thesis must account for 5 to 7 of these credits. Courses for the major must be taken in the major department or in related fields.

Requirements for the Minor or Supporting Courses

A minimum of 8 credits must be earned in the minor or supporting course fields for a Master's degree. Supporting courses in two or more departments may be taken in lieu of a minor if approved by the major adviser.

Courses in the major department may be used as supporting courses, provided they are considered sufficiently diverse by the major department.

Plan of Study

A graduate student during his first term of study must work out a plan of study for the Masters' degree. The plan should be worked out with his adviser, approved by the adviser and head of the major department, and submitted on an appropriate form

to the Graduate School for approval. The student, major adviser, and others concerned will be notified of action taken by the Associate Dean.

After approval, changes in the plan of study must be requested on a form furnished by the Graduate Office. Changes must be approved by the adviser, department head and Associate Dean.

Transfer of Credits

Graduate credits earned at other institutions may be applied toward the Master's degree. They must, however, have been approved for transfer by the department(s) concerned and by the Dean of the Graduate School. Such transfer is limited to 7 credits in the major and 3 credits in the minor or supporting courses. The credits must have been earned at a grade of at least "B" for each course. Out-dated coursework will not be accepted for transfer.

Requests for transfer credit must be supported by an official transcript filed at the Graduate Office.

Admission to Candidacy

Admission to the Graduate School does not imply admission to candidacy. A student is admitted as a candidate only after 20 graduate credits have been earned (transfer credits may apply here), provided: (1) the grade point average is "B" or better in the major and "B" or better in the minor or supporting courses, (2) reasonable progress has been made in the research for the thesis, (3) an approved program of study is on file at the Graduate Office, and (4) the major adviser recommends it.

A student must be admitted to candidacy before taking his oral examination.

The Thesis

All students completing a Master of Arts or Master of Science degree must submit a thesis meeting the requirements of the Department and the Graduate School. Requirements of the Graduate School are outlined in the mimeographed "Instructions for Thesis and Research Reports" available from the Graduate Office. Requirements of a Department as to style, although they may differ, should be followed. A thesis guide, such as William Giles Campbell, **Form and Style in Thesis Writing,** Boston: Houghton Mifflin, 1954, available from the Bookstore, may be helpful to the student.

The thesis should represent a scholarly contribution to knowledge by the candidate of research related to the major field. Although the thesis accounts for 5 to 7 credits in the major, the number of credits is not necessarily related to the amount of research work completed. Thesis credits are given for both the research and writing required for the thesis. Grades for thesis are turned in as Incomplete (I) until after the oral examination. If accepted by the examination committee, the major adviser and the Associate Dean of the Graduate School, one grade for all the thesis is turned in.

Two copies of the thesis (original and one copy) must be filed with the Graduate Office for examination at least 10 days (excluding Sundays and holidays) prior to the oral examination. The student should pick up these copies after they have been examined in the Graduate Office and distribute (along with his other copies) one copy to each member of his committee. The original and one copy, corrected in accordance with suggestions by the examination committee and the Graduate Office, must be returned to the Graduate Office with a receipt from the Library showing that $5.00 has been paid for part of the cost of binding. This should be completed at least 5 days prior to Commencement.

Examination

Candidates for a Master's degree are required to pass an oral examination covering the research, and courses included in the graduate program. This must be done not less than 10 days (excluding Sundays and holidays) prior to Commencement.

The examining committee includes (1) the major adviser (chairman), (2) a member of the Graduate Faculty appointed by the Dean and representing the Graduate Faculty, (3) one additional representative from the major field, and (4) one representative from the minor or supporting course field. The major adviser selects the committee members (except for the representative of the Graduate Faculty) and submits their names to the Associate Dean of the Graduate School for approval.

THE MASTER OF EDUCATION DEGREE

The Master of Education degree is offered under two options (see Residence and Credit Requirements below) and with the following majors:

Agricultural Education
Education
English
Guidance and Counseling
Home Economics Education
Journalism
Physical Education
Speech
Biological Science*
Physical Science*
Social Science*

The Advisers

Each student in the Master of Education degree program will choose a major adviser through consultation with the head of the department or the chairman of the committee concerned. A minor adviser is also chosen when a minor field is selected. The major adviser should be chosen prior to registration for the first semester of work, and the minor adviser should be chosen as soon thereafter as possible.

Different departments and areas use different systems of assigning advisers, but each department or committee will insure adequate guidance for its students throughout their graduate work.

Residence and Credit Requirements

The Master of Education degree is offered under two options. Option A requires no thesis but does require a research report. Option B requires no thesis nor any research report. The residence and credit requirements for these two options are as follows:

Option A: A minimum of 32 graduate credits beyond the Bachelor's degree is required. The minimum residence requirement is 22 credits of graduate work, and 2 credits must be earned as a research problem in the major field.

Option B: A minimum of 35 graduate credits beyond the Bachelor's degree is required. The minimum residence requirement is 25 credits. No research problem is required, but a comprehensive written examination is required in addition to the final oral examination.

Under both options, residence credit is given only for courses offered by South Dakota State University.

Outdating of Course Work

If the requirements for the Master of Education degree are not completed within a period of 6 years from the date of application, a reconsideration of the student's program will be necessary. Credits in courses more than 6 years old will be allowed only if the course is repeated, if an examination covering the material is passed, or by approval of the Graduate Council after petition adequately explaining why the student could be expected to be proficient in the course(s). The rules of the Graduate School in effect at the beginning of the seventh year following admission of the student to work toward the Master of Education degree will apply if the degree has not been granted by then.

Requirements for the Major

Option A: Of the minimum of 32 graduate credits required for the degree at least 21 (including 2 for the research problem) must be earned in the major.

Option B: Of the minimum of 35 graduate credits required for the degree, at least 24 must be earned in the major.

Requirements for the Minor or Supporting Courses

At least 8 graduate credits must be earned in the minor or in supporting courses under either Option A or Option B. When supporting courses are taken in lieu of the minor, they are selected from two or more departments with the approval of the major adviser.

Students majoring in Agricultural Education, Education, Guidance and Counseling, Home Economics Education, or Physical Education under the Master of Education program may not apply education courses (Agricultural Education, Education,

*See Special Programs section under Courses of Instruction.

Industrial Arts Education, Home Economics Education, Physical Education) in their minor or supporting courses.

Students majoring in Biological Science, Physical Science, or Social Science take their minor in Education.

Program of Study

During the first term of work, a graduate student should plan with his adviser(s) the program of study for the Master of Education degree. This program, approved by the adviser(s) and the head of the major department or the committee chairman concerned, is submitted on the appropriate form to the Dean of the Graduate School for his approval. It must be submitted prior to the end of the first term of graduate work. The student, major adviser, and others concerned will be notified of the action taken by the Dean.

Once the program of study is approved, all changes must be requested on an approved form furnished by the Graduate Office. To be allowed, these changes must be approved by the appropriate adviser, the department head or committee chairman, and the Associate Dean of the Graduate School.

Transfer of Credits

Graduate credits earned at other institutions may be applied toward the Master of Education degree. They must, however, have been approved for transfer by the department(s) or committee concerned and by the Associate Dean of the Graduate School. Such transfer is limited to 7 credits in the major and 3 credits in the minor or supporting courses. The credits must have been earned at a grade of "B" or better for each course. Outdated coursework will not be accepted for transfer.

Requests for transfer credit must be supported by an official transcript filed with the Graduate Office.

Admission to Candidacy

Admission to the Graduate School does not imply admission to candidacy. A student is admitted as a candidate only after 20 graduate credits have been earned (transfer credits may apply here) provided: (1) the grade point average in the major and in the minor or supporting courses is "B" or better; (2) reasonable progress has been made in the research report in the case of Option A students, (3) an approved program of study is on file at the Graduate Office, and (4) the major adviser recommends it.

The Research Report (Option A)

The research report is required under Option A. It is based on research done in the major field and is written in accordance with instructions outlined in the publication, "Instructions for Theses and Research Reports," available in the Graduate Office.

The research problem for this report must account for 2 credits in the major. These credits are included in the minimum of 21 required in the major. The research is not considered complete until its methods and findings have been recorded in a form acceptable to the major adviser, the examination committee, and the Associate Dean of the Graduate School.

Three acceptable copies of the research report must be filed at the Graduate Office at least 10 days (excluding Sundays and holidays) before the oral examination. Following the oral examination and approval of the research report, the original and first copy are delivered bound by the Printing Laboratory, to the major department office. This must be done not later than 5 days before Commencement.

Language Requirement

There is no general language requirement for the Master of Education degree. However, individual departments may require a speaking or reading knowledge of a foreign language.

Examinations

Option A: Candidates for the Master of Education degree under Option A are required to pass an oral examination covering the research and courses included in the graduate program. This must be done not less than 10

days (excluding Sundays and holidays) prior to Commencement. Before taking the examination, the student must have been admitted to candidacy.

Option B: Candidates for the Master of Education degree under Option B are required to pass both a comprehensive written and oral examination over the coursework in their graduate program. This must be done not less than 10 days (excluding Sundays and holidays) prior to Commencement, and the oral examination cannot be taken until the written examination has been completed and graded. Before taking either examination, the student must have been admitted to candidacy.

The examining committee under either option is composed of: (1) the major adviser (chairman), (2) a member of the Graduate Faculty appointed by the Dean and representing the Graduate Faculty, (3) one additional representative from the major field, and (4) one representative from the minor or supporting course field. Except for the representative of the Graduate Faculty, the major adviser selects the committeee members, subject to the approval of the Associate Dean of the Graduate School.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy Degree is offered with the following majors:

Agricultural Engineering
Agronomy
Animal Science—offered in the Animal Science or Dairy Science Departments
Chemistry
Civil Engineering
Economics
Entomology
Plant Pathology
Sociology

Admission Requirements

Applicants for the Doctor of Philosophy degree program usually must have a Master's degree. Those not meeting this requirement will be required to enter a Master's degree program unless they have a grade point average of "B" (3.0) or better for the last two years of undergraduate study.

Residence and Credits Requirements

A minimum equivalent to three academic years of full-time work beyond the Bachelor's degree (90 credits including transfer and thesis credits) is required for the Doctor of Philosophy degree. Credit earned for the Master's degree may be applied. The minimum residence requirement is 30 credits earned at South Dakota State University and at least one continuous academic year of full-time work toward the degree (or the equivalent in continuous half-time or more work) after admission to work toward the Doctor of Philosophy degree. Those on full-time faculty appointment and graduate assistants may satisfy the continuous residence requirement in one academic year.

The individual area or department in which the Doctor of Philosophy degree is granted, or the student's advisory committee, may require more credits and residence than the minimum indicated above if they feel it is in the best interest of the student.

Outdating of Program and Coursework

If the requirements for the Doctor of Philosophy degree are not completed within a period of 8 years from the date of admission to work toward the degree, a reconsideration of the student's program will be necessary. In such cases, the rules of the Graduate School governing at the beginning of the ninth year will become effective for the student.

A course taken 8 years previously cannot be applied toward the Doctor of Philosophy degree program except by permission of the advisory committee and the Associate Dean of the Graduate School.

The Advisory Committee

Upon recommendation of the major adviser, and before the student has completed the equivalent of 40 credits (including transfer credits and those earned for the Master's degree) toward the Doctor of Philosophy degree, the Associate Dean of the Graduate School will appoint an advisory committee for the student. This committee will be composed of at least 5 members of the Graduate Faculty, as follows:

(1) The major adviser who acts as chairman of the committee.
(2) A member from a department representing an area not closely related to the major or minor department or area. This member represents the Graduate Faculty, insuring that its rules and regulations are followed by the committee.
(3) The head of the major department or of a department in the area of the major, or his representative.
(4) The minor adviser or a representative from an area where the supporting courses will be taken.
(5) One member other than those listed above selected by the major adviser.

Additional members of the committee may be asked for by the student or the major adviser and assigned to the committee by the Associate Dean of the Graduate School.

The Program of Study

Within 6 weeks after appointment, the advisory committee will meet with the student to plan a complete program of study and to consider a thesis topic. The program of study must be forwarded to the Graduate Office not later than 2 weeks prior to the preliminary examinations. The program submitted is subject to the approval of the Associate Dean of the Graduate School, and until it is approved the student cannot take the preliminary examination.

Any changes in the program of study, once it is approved, must be approved by the advisory committee and the Associate Dean of the Graduate School.

Appropriate forms for the plan of study and changes thereto are available at the Graduate Office.

Transfer of Credits

Transfer credits earned at other institutions may be applied toward the Doctor of Philosophy degree if they were earned in residence at the institution at a grade of at least "B," and if they are approved by the advisory committee and the Associate Dean of the Graduate School. Transfer credits cannot substitute for credits required for minimum residence (See Residence and Credit Requirements).

Requests for transfer credits must be supported by an official transcript filed with the Graduate Office.

The Major

At least 60 credits of the 90 required for the degree must be earned in the major. Thesis, transfer, and Master's degree credits may apply here. Not all courses need be taken within a single department or area, but all courses applying to the major should be closely related to it.

The Minor or Supporting Courses

At least 15 credits of the 90 required for the degree must be earned in a minor or in supporting courses (coursework chosen from two or more fields). Transfer credits and credits from the Master's degree program may apply here. All courses applying in the minor or supporting courses must be taken outside the major department or area.

Language Requirement

Reading knowledge of two foreign languages or of one foreign language and proficiency in collateral field is required. Usually these languages are French and German, but other languages may be permitted with the approval of the advisory committee and the Associate Dean of the Graduate School. The Foreign Languages department administers the language examinations and certifies by letter to the Graduate School their successful completion.

To take an examination, the student must first submit a request to the Foreign Language department on a form supplied at that office. This must be done no later than the second week in the term during which the examination is to be taken. Dates of the examinations will be announced by the Foreign Languages department.

A student whose native tongue is other than English and who expects to return to his own homeland may, on recommendation of his advisory committee, be permitted to meet the language requirements by demonstrating competence in spoken and written English and a reading knowledge of one approved language other than his native language.

On recommendation of the advisory committee and the approval of the Associate Dean of the Graduate School, a student may substitute a collateral field of knowledge for the second language. Courses in the collateral field must be taken for credit (not audited) which will not apply to the major, minor, or supporting courses. The collateral field of knowledge should be related to the major field of study, and should be concentrated in one field of study. It consists of at least 8 credits of coursework at either the graduate or undergraduate level. Such fields as mathematics, semantics, or statistics may, for example, be used to meet these requirements. All grades earned must average at least "B" (3.0) and only those credits earned at a grade of "C" or better may be counted toward fulfilling this requirement.

The foreign language and the collateral field requirements must be completed before the student is admitted to the preliminary examinations.

The Preliminary Examinations

When the student's program of coursework has been substantially completed, and after the language requirement has been met, the preliminary examinations covering coursework are taken. The first of these is a comprehensive written examination which is followed on satisfactory completion by an oral examination.

The advisory committee arranges for the examinations, which it conducts at times approved by the Associate Dean of the Graduate School. Review of the examinations is accomplished by all members of the advisory committee and the results are reported to the Associate Dean of the Graduate School on an appropriate form.

The preliminary examinations must be completed satisfactorily at least 6 months before the final examination is taken.

The Thesis

The thesis should represent at least one academic year of full-time research. Of no specific length, it should advance or modify knowledge and demonstrate the candidate's mastery of the subject. The instructions in "Instructions for Thesis and Research Reports," copies of which are available at the Graduate Office, must be followed in preparation of the thesis. When submitted, it is accompanied by an abstract of 600 words or less.

After the manuscript is typed and approved by the major advisor, the first three copies are delivered to the Graduate Office. This must be done at least 10 days (excluding Sundays and holidays) prior to the date of the final oral examination. After the thesis is found acceptable as to form by the Graduate Office, a copy is delivered to the members of the advisory committee for their examination.

After the final oral examination, all necessary corrections in the thesis are made and the first three copies are delivered to the Graduate Office. This must be done at least 5 days prior to Commencement. A $5.00 fee is paid at the library to partially cover the cost of binding the first two copies (library copies). The third copy will be returned to the major department, unbound. The binding of this third copy and of any others will be handled in accordance with departmental policy.

The student must also go to the library and sign an agreement relating to the publication of the abstract and the microfilming of the thesis. At this time a fee of $25.00 covering the cost of microfilming must be paid. This must be done at least 5 days prior to Commencement.

The Final Examination

The final oral examination is scheduled no sooner than 6 months following satisfactory completion of the preliminary examinations, and after the candidate's coursework and thesis have been completed. It is conducted by the advisory committee at a time and place announced by the Graduate Office.

While the advisory committee determines the character and length of the examination, sufficient time should be devoted to a consideration of matters relating to the thesis to test thoroughly the ability of the candidate to defend the research. In addition, questions to test the candidate's general knowledge, judgment, and critical powers are usually asked.

The final oral examination must be completed at least 10 days prior to the Commencement at which the degree is to be granted.

Courses of Instruction

COURSE NUMBERING SYSTEM

The numbering system for courses which may apply to the graduate programs offered at South Dakota State University is explained as follows:

700-799 series

Courses numbered from 700 through 799 are graduate level and are open to graduate students only (except seniors by permisison. See page 4).

600-699 series

Courses numbered from 600 through 699 are graduate level courses but are open to undergraduate students having the necessary prerequisites. They may not be used as a requirement for the Bachelor's degree at this institution, but they may serve as electives in an undergraduate program. Not open to freshmen or sophomores.

300-599 series

Courses numbered 300 through 599 are advanced undergraduate level courses. They are not listed in this bulletin, but are listed in the general catalog. They may be used in meeting part of the requirements for graduate degrees in accordance with the following:

(1) Total credit for courses in this series, when applied to a graduate program, will be reduced by 20% discarding all fractions. After such conversion, these credits are defined as "converted credits," which are then considered as graduate credits in meeting the requirements for the various degrees, provided that a grade of at least "B" is attained in each course in this series. For example, if 8 credits are earned in this series, they would be equivalent to 6 graduate credits if applied to a graduate degree.

(2) For the Master of Arts, Master of Science or Master of Education degrees, no more than 7 converted credits may be applied to the graduate program. They may be applied in the major, minor, or supporting courses.

(3) For the Doctor of Philosophy degree, no more than 10 converted credits may be applied to the graduate program. They may be applied in the major, minor, or supporting courses.

(4) Transfer credits may not be applied here.

(5) Converted credits may not be applied without the permission of the major adviser or advisory committee, the minor adviser (when applicable), and the Associate Dean of the Graduate School.

Note: When courses in the 300-599 series are applied to a graduate program, they are entered on the transcript without special notation. It is doubtful, therefore, that they could be transferred as graduate credit to another institution.

ABBREVIATIONS USED

Cr, Credit P, Prerequisite F, Fall semester S, Spring semester Su, Summer session

4(3,2) Following course titles, this system is used to describe the distribution of credits. The number preceding the parenthesis represents the credit for the course, the first number in the parenthesis the number of lecture periods, and the second number in the parenthesis the number of hours of laboratory per week.

Other abbreviations used are explained in the text.

DEPARTMENTS AND COURSES

The departments, their individual requirements, and the courses they give are listed on the following pages.

SPECIAL MAJORS

Three special majors are offered under the Master of Education degree program. These are described below since they are directed by a committee instead of a single department.

Biological Science Major (Master of Education)

The curriculum leading to the Master of Education degree, Biological Science major, has been established to meet the needs of high school teachers whose teaching interests include botany, zoology, and bacteriology, and of those who wish to prepare themselves to teach in an integrated biological science course. The candidate for this degree may choose his adviser from any of the three departments involved.

Admission to this program requires: (1) a full year of college botany, (2) a full year of college zoology which should include one term of physiology, (3) a basic bacteriology course, and (4) courses in education sufficient to meet state certification requirements.

The requirements for the major are the same as those for other Master of Education degree programs except that the coursework is done in the biological sciences, as approved by the committee in charge of this major.

The minor is taken in education, and the minor adviser is chosen from the Education department.

Either Option A or Option B may be used for this program.

Physical Science Major (Master of Education)

The curriculum leading to the Master of Education degree, Physical Science major, has been established to meet the needs of high school teachers whose teaching interests include chemistry, mathematics, and physics, and those who wish to prepare themselves to teach an integrated physical science course. The candidate for this degree may choose his adviser from any of the departments involved.

Admission to this program requires: (1) introductory courses consisting of a year of college chemistry and a year of college physics, (2) college mathematics courses including elementary differential and integral calculus, and (3) courses in education sufficient to meet state certification requirements.

The requirements for the major are the same as those for other Master of Education degree programs except that the coursework is done in the departments of Chemistry, Mathematics, and Physics. In one of these departments at least 10 credits must be earned. In the other two, at least 9 credits, about equally divided between the two, must be earned.

The minor is taken in education, and the minor adviser must be chosen from the Education department.

Either Option A or Option B may be used for this degree.

Social Science Major (Master of Education)

The curriculum leading to the Master of Education degree, Social Science major, has been established to meet the needs of high school and junior college teachers whose teaching interests include economics, history, political science, and sociology, and those who wish to prepare themselves to teach an integrated social science course. The candidate for this degree may choose his adviser from any of the departments involved.

Admission to this program requires: (1) at least 24 semester credits in the social sciences, including a basic course or sequence of courses in economics, history, political science, and sociology, and a basic course in statistics, and (2) courses in education sufficient to meet state certification requirements.

The requirements for the major are the same as those for other Master of Education degree programs except that the coursework is done in the departments of Economics, History and Geography; Political Science, and Rural Sociology. At least 9 credits must be earned in either economics, geography, history, political science, or sociology. In the remaining three fields, at least 10 credits, about equally divided between them, must be earned.

The minor is taken in education, and the minor adviser must be chosen from the Education department.

Either Option A or Option B may be used for this degree.

DEPARTMENT OF AEROSPACE MANAGEMENT

Professor Tristram J. Cummins, Head
Professor James W. Geiger (Courtesy appointment) AFIT

Graduate major offered: Presently no major is offered in this area.

Graduate minor offered: Aerospace Management.

This minor is offered at Ellsworth Air Force Base to Minuteman Officers taking a major in Economics.

Prerequisites for graduate study:

A Bachelor's degree is a prerequisite. A background in the social sciences and statistics is helpful, but not essential. Essential areas in which deficiencies exist will be overcome with additional courses.

Aerospace Management Courses (AM)

602 Supply Management Seminar 2(2,0)

A detailed analysis is made of the interrelationships of Air Force supply with other major logistics functions of maintenance, procurement, transportation, and marketing. Laboratory exercises involve requirements determination, inventory management, and distribution of inventories. An evaluation is made on the several selective management techniques used in the Air Force supply system. The course actually applies to supply functions those management concepts developed in A.M. 202, "Introduction to Aerospace Management."

612 Maintenance Management Seminar 2(2,0)

This course is an analysis and evaluation of the USAF maintenance complex; the base-level Maintenance Management Program including the budgetary and organic-contractor workload relationship. An analysis is made of Department of Defense directives applicable to the maintenance function, together with a study of Army and Navy maintenance management programs. Laboratory work consists of a detailed examination of actual management information tools used at base and depot levels. This course actually applies to maintenance functions those management concepts developed in A.M. 202, "Introduction to Aerospace Management."

622 Procurement and Production Seminar 2(2,0)

The overall objective of the course is to broaden the student's knowledge of the defense procurement process so that, as a logistics manager, he may better understand the economic, technical, legal, and regulatory facts involved in that process and better understand the impacts of those factors on logistics management.

Because the bulk of the defense procurement dollar is spent on the acquisition of weapon systems and because many of the significant problems in other types of defense procurement derive from the "nonmarket" character of the weapons acquisition process, the course concentrates heavily on an analysis of weapons acquisition and follow-on procurement. This analysis includes the following: a study of the role of procurement in the logistics process; the history and sources of procurement authority within the Department of Defense; procurement policy with regard to the method of procurement and with consideration of the effectiveness with which the policy is applied; an analysis of the weapons acquisition process with emphasis on the role of the government as buyer; the nature and structure of the defense industry; the impact of uncertainty on the weapons acquisition process; contractor and subcontractor selection; and appraisal of the use of competitive and contractual incentives in the weapons acquisition process. This course actually applies to procurement functions those management concepts developed in A.M. 202, "Introduction to Aerospace Management."

632 System Program Management Seminar 2(2,0)

The objective of this course is to provide an understanding of the practical aspects of systems program management across the broad spectrum of systems program office operations and responsibilities. Students will acquire an understanding of the systems management environment and the problems encountered in the following: the acquisition of complex weapon and support systems, including a comprehensive overview of the climate in which the systems program office operates; the policies, procedures and functional interrelationships governing these operations; the role and responsibilities of the using and participating commands and agencies supporting the SPO; and the actions required to resolve typical systems program management issues in such areas as contract with DOD, USAF, AFSC, and the participating commands. This course actually applies to SPO functions and those management concepts developed in A.M. 202, "Introduction to Aerospace Management."

642 Logistics Planning 2(2,0)

The objective of this course is for each student to gain an understanding of the theory of the logistics planning process and its application. The elements of logistics planning at each level of military command are emphasized. Student evaluations of the existing military logistics planning process will be required. Each student will actually develop a logistics plan for a current or future military operation. This course integrates all of the management concepts developed in A.M. 202 together with the four specialized seminars on supply, maintenance, procurement, and SPO.

652 Cost and Economic Analysis 2(2,0)

This course is designed to present a managerial approach to cost and economic analysis. Emphasis is placed at all times on an understanding of the outputs of the cost analysis process and how they can be used in military decision making. Competence

will be developed in applying methodologies and techniques of cost analysis by working assigned laboratory problems.

The subject material is structured in three major phases. The first phase consists of (1) a study of the complete spectrum of cost analysis used in military decision-making; (2) an analysis of the structures and concepts for cost and economic analysis in both the Defense industry and the Department of Defense, and (3) the cost analysis concepts used in military long-range planning and programming. The second phase involves the development of a working knowledge of the methodologies and techniques used in the cost analysis process. The third phase is concerned with the use of force structure analysis, cost sensitivity analysis and cost effectiveness analysis as a decision-making aid to more effective resource management.

DEPARTMENT OF AGRICULTURAL ENGINEERING

Professor D. L. Moe, Head
Professors DeLong, Wiersma; Associate Professors Lembke, Lytle, Shute, Turnquist

Graduate major offered: Master of Science degree with major in Agricultural Engineering. Doctor of Philosophy with a major in Agricultural Engineering.

Graduate minors offered: Agricultural Engineering, Mechanized Agriculture.

Prerequisites for graduate study:

For the graduate major a Bachelor of Science degree in engineering or its equivalent. For the graduate minor prerequisites to the graduate courses elected.

Agricultural Engineering Courses (AE)

612 Engineering Phases of Crop Processing 2(2,0)

Detailed analytical studies of cutting and shearing, collecting, packaging, size reduction, dehydrating, hauling, cleaning, and storing of agricultural crops. Includes one or more complete crop harvest and storage problems with reference to cost, labor, power requirements, and quality of finished product. P, 412, 422. Alternate years.

613 Instrumentation 3(2,3) S

Available instruments commonly used in Agricultural Engineering research. Principles and methods of measuring temperature, humidity, pressure, and flow with indicating and recording equipment. Application and instrumentation of SR-4 strain gage pressure and force transducers. P, Phy 215, Math 254.

652 Theoretical Micro-Climatology 2(2,0) F
(On sufficient demand)

Derivation and application of physical laws to air layer near the ground occupied by plants and animals. Instruments used to take measurements in layer near the ground. P, Calculus, Physics, AE 472.

702 Advanced Farm Buildings 2(2,0)
(Offered 1969)

Requirements of domestic animals for shelter and environment that shelter needs to provide for efficient and economical operation of animal enterprise; effect of total energy exchange on productivity of animals. P, 304. Alternate years.

722 Advanced Farm Land Engineering 2(2,0)
(Offered 1968)

Selected topics from fundamental concepts of model analysis; specific applications to problems involving viscous and gravitational phenomenon; varied flow equation applied to gravitational flow in drain-lines, open ditches and terraces; use of tractive force theory in earth channel design; principles of irrotational flow and characteristics of potential fields; use of Laplace's Equation in solving saturated flow problems. P, 423, Agron 452. Alternate years.

742 Advanced Farm Power and Machinery 2(2,0)
(Offered 1968)

Presentation of typical farm machine mechanisms; instruction in selection, design and application of various testing instruments for research and development; testing and evaluating machine components. P, 452. Alternate years.

750 Special Problems in Agricultural Engineering
1-2 (on demand)

Graduate students who wish to pursue detailed studies in one or several areas of the Agricultural Engineering field including meteorology and climatology.

752 Similitude 2 (1,2) (Offered in 1968)

A systematic approach and thorough treatment of the principles and theory of dimensional analysis, problems of model design and tests. The use of structural and fluid flow models in design as they pertain to Agricultural Engineering problems. P, Consent of instructor.

753 Energy Transfer in Agricultural Environment
3(2,2) (Offered in 1969)

Advanced studies in energy transfer which pertains to Agricultural crops, soils, climatology, fluids, machinery dynamics, and other materials. P, ME 343, ME 433, Agron 452 or equivalent courses.

763 Programming Agricultural Systems 3(2,2)
(Offered in 1970)

The use of programs and computers in advanced engineering for the solution of problems occurring in Agricultural Engineering studies. Gathering, processing, evaluating mass engineering and scientific data; emphasizing the use of modern high-speed computers, integrated data processing systems. P, CE 291, Math 413 or equivalent.

781 Graduate Seminar 1(1,0) (Offered in 1969)

Discussion and reports of current topics and investigations in Agricultural Engineering. (Limit of 2 credits for MS, 3 credits for Ph.D.) P, Consent of instructor.

790 Thesis in Agricultural Engineering
(as arranged)

DEPARTMENT OF AGRONOMY

Professor L. O. Fine, Head
Professors Brage, Derscheid, Kinch, Moore, Ross, Shank, Shubeck, Stone, Westin, Wells, White;
Associate Professors Albrechtsen, Buntley, Carson, Colburn, Horton, Hovland, Kenefick,
Lunden, Olson, Price, Rumbaugh

Graduate majors offered: Master of Science degree with a major in Agronomy (Soils or Crops).

Doctor of Philosophy degree with a major in Agronomy (Soils or Crops).

Graduate minor offered: Agronomy.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree including not less than 12 credits in either soils or crops courses.

For the graduate minor a Bachelor's degree including prerequisites for the graduate courses elected.

Agronomy Courses (Agron)

614 Biometry 4(4,0) F
Principles of statistical methods as applied to biological data with special reference to experimental design, reduction of experimental data and tests of significance and their interpretation. P, Math 113.

633 Advanced Genetics 3(3,0) F
Procedures in genetic studies, cytoplasmic influences, gene physiology, mutagenesis, chromosomal changes, linkage, and steps toward genetic code. P, Bio 303.

663 Advanced Weed Physiology and Control 3(3,0) F (Offered in 1968)
Physiological and ecological principles of weed control including methods of elimination. Chemistry and applications of herbicides. P, 233, Ch 134, Bot 424. Alternate years.

672 Soil Mineralogy 2(2,0) F (Offered in 1968)
Soil minerals and their identification. P, 213, 243. Alternate years.

703 Cytology 3(2,2) F (Offered in 1969)
Physio-chemical nature of cell inclusions with reference to their role in heredity. P, 422, 633. Alternate years.

713 Cytogenetics 3(2,2) F (Offered in 1968)
Nature and behavior of chromosomes in relation to heredity, with consideration of cytogenetic studies. P, 422, 633. Alternate years.

723 Advanced Plant Breeding 3(3,0) S (Offered in 1969)
Basic principles of quantitative variation in crop plants; method of analysis of effects due to genetic and environmental sources; and programs of improvement. P, 422, 614. Alternate years.

742 Advanced Soil Fertility 2(2,0) F (Offered in 1969)
Chemistry of soil-plant relationships; advanced theory and practice in use of fertilizers. P, 323. Alternate years.

743 Advanced Soil Physics 3(3,0) F (Offered in 1969)
Mechanisms responsible for flow of heat, water, and air through soils; application of the principles of mathematics and physics to solution of specific problems of saturated and unsaturated water flow, heat flow, and aeration in soils. P, Math 333. Alternate years.

753 Advanced Soil Chemistry 3(3,0) S (Offered in 1970)
Advanced chemical considerations of soil constituents in dynamic environment of soil; conditioning effects of climate and other environmental factors; characteristics, reactions, and importance of clay mineral and colloidal complex. P, 443. Alternate years.

772 Advanced Soil Morphology and Genesis 2(2,0) S (Offered in 1969)
Classification and nomenclature of soil; factors governing and processes active in soil development; soil geography. P, 414, 462. Alternate years.

773 Design and Analysis of Experiments 3(3,0) S (Offered in 1970)
Organization and integration of research projects with application of statistical methods and experimental design. Use of analysis of variance and covariance, variance components, multiple and curvilinear regression for data reduction and interpretation. P, 614. Alternate years.

780 Advanced Crops or Soil Problems 1 or 2 FSSu
Laboratory or field research with relevant literature reviews, conferences and reports. P, consent of instructor.

781 Agronomy Seminar 1(1,0) FS
Reports and discussions of current investigations in Agronomy (two credits required for M.S., three for Ph.D.).

790 Thesis 5-7 FSSu

DEPARTMENT OF ANIMAL SCIENCE

Professor Charles Lewis, Head
Professors Carlson, Dinkel, Embry, Kamstra, Kohlmeyer, Kohler, Morgan, Wahlstrom;
Associate Professors Bush, J. K. Lewis, McCarty, McCone

Graduate majors offered: Master of Science degree with a major in Animal Science or Poultry Science.

Doctor of Philosophy degree with a major in Animal Science.

Graduate minors offered: Animal Science.

Research toward the graduate degrees in this department may be pursued in the areas of animal breeding, animal nutrition, animal physiology, meat technology, range management or poultry nutrition.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree including not less than 12 credits in Animal Science.

For the graduate minor a Bachelor's degree including prerequisites for the graduate courses elected.

Animal Science Courses (AS)

600 Research Problems 1-3 FSSu

Investigation of problems in following areas with results submitted as technical paper:

1. Animal breeding
2. Nutrition
3. Meats
4. Livestock Production
5. Range management
6. Reproductive Physiology

601 Wild Lands Seminar 1(1,0) S

Guest lectures and review of current research and action programs in use of wild lands. P, 323 and senior standing. Limit 2 credits.

602 Wool Technology 2(1,2) S (Offered in 1969)

Factors relating to wool production and marketing. Grading wool, properties of wool and wool technology. P, 413. Alternate years.

612 Advanced Livestock Feeding 2(2,0) F

Application of recent research findings in feeding of swine, cattle and sheep. P, 243, 251.

614 Meat Technology 4(2,4) S (Offered in 1970)

Basic physical, chemical, microbiological and histological characteristics of meat and effects of various processing methods on meat products and by-products. P, 213. Alternate years.

702 Experimental Procedure 2(2,0) S

Research methods and planning of experimental work, necessary records, interpretation of results and presentation of material. P, Agron 614 or equivalent.

703 Animal Nutrition 3(3,0) S (Offered in 1969)

Principles of nutrition in relation to growth, reproduction, lactation, fattening and work. P, Ch 615. Alternate years.

712 Advanced Animal Breeding 2(1,2) S (Offered in 1970)

Methods of data analysis for developing efficient breeding plans. Calculation and use of correction factors, heritability estimates, genetic correlations, selection indices and inbreeding charts. P, 324, Agron 614 or equivalent courses. Alternate years.

713 Population Genetics 3(3,0) S (Offered in 1969)

Genetic structure of population and forces affecting this structure. P, 324 or equivalent. Alternate years.

722 Animal Nutrition Laboratory 2(0,6) S (Offered in 1969)

Laboratory methods course involving demonstration and practical work in techniques used in animal nutrition research. P, Ch 615. Alternate years.

723 Ruminology 3(3,0)

See Dairy Science 723 for description.

743 Advanced Physiology of Reproduction 3(2,2) (Offered in 1970)

Anatomical and physiological processes of reproduction of domestic animals with special emphasis on research techniques and the findings of recent research. P, 443.

751 Graduate Seminar 1(1,0) FS

Reports and discussion of current research in animal science. Maximum of two credits for M.S. and four credits for Ph.D.

761 Nutrition Seminar 1(1,0) FS

Reports and discussion of current research in nutrition. Maximum of two credits.

790 Thesis in Animal Science 5-7 as arranged

Poultry Science Courses (PS)

610 Special Topics in Poultry Science 1-3 FS

Advanced study of one or more selected topics such as nutrition, physiology, research methodology, or marketing.

710 Graduate Research Problems 1-3 FS

Planning, conducting, summarizing, and reporting research in some phase of poultry science. P, graduate classification.

753 Poultry Genetics 3(3,0) S
Population studies in poultry breeding. Physiological expression of genetic characteristics. Heritability coefficients. Comparison of and theoretical bases for different breeding systems. P, 353, 473.

761 Nutrition Seminar 1(1,0) FS
Reports and discussion of current nutrition research.

773 Nutritional Interrelationships 3(3,0) F
Relationships between nutrients in metabolism. Substitution and sparing effects. Comparative metabolic significance of required nutrients for different animal species. P, Ch 763.

790 Thesis in Poultry Science FSSu

DEPARTMENT OF BACTERIOLOGY

Professor G. W. Robertstad, Head
Professors Berry, Pengra and Middaugh; Associate Professor Parikh

Graduate majors offered: Master of Science degree with a major in Bacteriology.
(See also Master of Education degree program with a major in Biological Science, page 16.)

Graduate minor offered: Bacteriology.

Prerequisites for graduate study:
For the graduate major, a Bachelor's degree with major work substantially equivalent to that required by this department.
For the graduate minor a Bachelor's degree including prerequisites for the graduate courses elected.

Bacteriology Courses (Bac)

600 Microbiology Problem. 1-2 credits FSSu
Research problem in Bacteriology, Animal Virology and Animal Mycology. Two credits maximum. P, senior standing and consent of instructor.

603 Virology 3(1,6) F
Viral and rickettsial infections of animals, biochemical and biophysical properties of viral agents, viral growth in tissue culture and its immunological characterization and the role of viral vaccines and antiviral drugs. P, Bac 403.

604 Medical Mycology 4(2,4) S
A study of the etiological agents of animal and human mycoses, host response to these agents and contaminating saprophytic fungi. P, Bac 414.

624 Systematic Bacteriology 4(2,4) S
(Offered in 1970)
Bacterial nomenclature and practice in identification. Taxonomic descriptions of relationships among bacterial families and genera. Genetics of bacteria. P, Bac 304. Alternate years.

701 Graduate Seminar 1(1,0) FSSu
P, graduate student. Two credits maximum.

704 Bacterial Metabolism 4(2,4) F
(Offered in 1969)
Biological oxidations, fermentation mechanisms, metabolism of nitrogenous compounds, aerobic respirations, enzyme inductions and laboratory techniques. P, Bac 204 and Ch 615. Alternate years.

714 Industrial Microbiology 4(2,4) S
(Offered in 1969)
Techniques for production of microorganisms and their biochemical products of commercial importance. Laboratory studies with molds, yeasts, and bacteria to produce antibiotics, organic acids and solvents utilizing surface and submerged techniques. P, Bac 204, Ch 615 or consent of instructor. Alternate years.

790 Thesis in Microbiology 5-7 FSSu

DEPARTMENT OF BOTANY AND BIOLOGY

Associate Professor G. A. Myers, Head
Professors Holden, Miller (Emeritus), Morgan; Associate Professor Taylor

Graduate majors offered: Master of Science degree with a major in Botany.
(See also Master of Education degree program with a major in Biological Science, page 16.)

Graduate minor offered: Botany.

Prerequisites for graduate study:
For the graduate major a Bachelor's degree, including 24 credits in plant sciences, 16 of which must be in botany.
For the graduate minor a Bachelor's degree, including 16 credits in plant sciences, 10 of which must be in botany.

Botany Courses (Bot)

604 Growth and Development 4(1,6) S (Offered in 1970)
Relations of light, temperature, water, wind, growth regulators, nutrients and other factors to various stages of plant growth and development. P, 424, Ch 134. Alternate years.

614 Advanced Plant Physiology 4(1,6) S (Offered in 1969)
Role of organic and inorganic compounds in plant nutrition. Emphasis on photosynthesis, respiration, metabolism, and other cellular processes. P, 424, Ch 134. Alternate years.

624 Morphology of Non-Vascular Plants 4(2,4) F
Life histories and evolutionary relationships of principal orders of lower plants. P, Bio 113.

634 Morphology of Vascular Plants 4(2,4) S
Life histories and evolutionary relationships of principle orders of vascular plants. P, Bio 113-123.

653 Aspects of Morphogenesis 3(0,6) S
Determinative differentiation in growing points of plant axis. P, 413 or 634.

703-713 Advanced Taxonomy 3(2,2) FS
Detailed study of families of higher plants; professional methods of taxonomic research and publication. P, consent of instructor.

790 Thesis in Botany 5-7 as arranged FSSu

Biology Courses (Bio)

603 Teacher Preparation in BSCS Biology 3(2,2) FSu
To impart to the prospective teacher of BSCS Biology a thorough understanding of the investigatory approach to teaching, and provide him a detailed working knowledge of one of the "Versions" of BSCS Biology. P, consent of instructor.

701 Graduate Seminar 1(1,0) FS
Reports and discussions of original and contemporary research. P, graduate standing.

720 Biological Research Problem 2-4 credits, FSSu
Introduction to Biological Research.

DEPARTMENT OF CHEMISTRY

Professor Victor S. Webster, Head
Professors Emerick, Halverson, Johnson, Klug, Olson, Whitehead;
Associate Professors Brandwein, Greb, Palmer, Spinar, Wadsworth

Graduate majors offered: Master of Science degree with a major in Chemistry.
(See also Master of Education degree program with a major in Physical Science, page 16.)
Doctor of Philosophy degree with a major in Chemistry.

Graduate minors offered: Chemistry.

Prerequisites for graduate study:
For the graduate major a Bachelor's degree with a major in professional chemistry.
For the graduate minor a Bachelor's degree including prerequisites to the graduate courses elected.

Chemistry Courses (Ch)

603-613 Physical Organic Chemistry 3(3,0) FS
Study of organic reaction mechanisms. P, 320, 420.

610 Special Problems *(0,*) FS
Research problems in chemistry. Strongly recommended for senior chemistry majors. P, consent of instructor. Limited to a total of 4 credits.

615 Principles of Biochemistry 5(3,6) F
Chemistry of biological processes of plants and animals. P, 134.

622 Atomic and Molecular Structure 2(2,0) S (Offered in 1969)
Molecular binding and introduction to quantum mechanics. P, 320, 420. Alternate years.

623 Structural Determination of Organic Compounds 3(1,6) F (Offered in 1968)
Preparation of typical organic compounds with emphasis on yield and purity of product. P, 320, 420. Alternate years.

633 Modern Chemistry for High School Teachers 3(5,4) Su (8 weeks)
Review of modern concepts of chemistry. P, 115 or 171, 173 and 134, 214 or equivalent.

643 Advanced Inorganic Chemistry 3(3,0) S (Offered in 1969)
Selected topics in modern inorganic chemistry. P, 413. Alternate years.

653 Descriptive Inorganic Chemistry 3(2,3) S (Offered in 1970)
Laboratory work will include preparation and purification of typical inorganic compounds. P, 115 or 171 and 173. Alternate years.

663 Selected Topics in Analytical Chemistry 3(2,3) S (Offered in 1970)
Theory and practice in modern analytical chemistry. P, 424. Alternate years.

673 Selected Topics in Analytical Chemistry 3(2,3) S (Offered in 1969)
Theory and practice in modern analytical chemistry. P, 424. Alternate years.

703 Lipids 3(3,0) F (Offered in 1969)
Selected topics on lipids and related compounds. P, 615. Alternate years.

711-721 Seminar 1(1,0) FS
Required of all graduate majors in chemistry.

713-723 Advanced Physical Chemistry 3(3,0) FS (Offered in 1969-70)
Selected topics in physical chemistry. P, 420. Alternate years.

722 Stereochemistry of Carbon Compounds 2(2,0) S (Offered in 1970)
Isomerism due to spatial arrangement of atoms or groups. P, 320. Alternate years.

732 Biochemical Techniques 2(0,6) S
Research techniques of modern biochemistry pertaining to separation, isolation, purification and measurement of compounds of biological importance. P, 615.

733-743 Advanced Organic Chemistry 3(3,0) FS (Offered 1969-70)
Selected topics in organic chemistry. P, 613. Alternate years.

753 Chemistry of Enzymes 3(3,0) F
Kinetics, modes of action and properties of enzymes and enzyme systems. P, 615.

763 Intermediary Metabolism 3(3,0) S
Intermediary metabolism of carbohydrates, proteins and fats in animals, plants and micro-organisms. P, 615.

773 Carbohydrates 3(3,0) F (Offered 1968)
Selected topics on carbohydrates. P, 615. Alternate years.

783 Proteins and Nucleic Acids 3(3,0) S (Offered 1970)
Selected topics on proteins and nucleic acids. P, 615. Alternate years.

790 Thesis in Chemistry, credit as arranged, FS.

DEPARTMENT OF CHILD DEVELOPMENT AND FAMILY RELATIONS

Associate Professor Jay Richardson, Acting Head

Graduate major offered: Master of Science degree with a major in Child Development and Family Relations.

Graduate minor offered: Child Development and Family Relations.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with a major in Child Development and Family Relations, or Home Economics, Sociology, or Psychology, plus the prerequisites to courses to be pursued in child development and family relations.

For the graduate minor a Bachelor's degree including prerequisites to the courses elected.

In addition to the courses listed below, graduate majors in Child Development and Family Relations will be required to spend a minimum of one semester in residence at the Merrill-Palmer Institute in Detroit, Michigan, as a part of their academic training.

Child Development and Family Relations Courses (CD)

612 American Woman 2(2,0) S (On Demand)
Recent literature regarding changing role of woman, her developmental tasks and unique contribution she has to make in dynamic 20th century America. P, 322, or equivalent.

623 Child and Family Counseling 3(3,0) F
Theory and philosophy of counseling with children and their families. P, consent.

630 Seminar in Human Development and Family Relations 1-2 (1-2,0) (On sufficient demand)
Reports and discussions of current literature, including research methodolgy in area of human development, personality, family relations, marriage and family counseling. Maximum of 4 credits may be applied on advanced degree. P, consent.

680 Special Problems in Human Development and Family Relations 2-4 credits as arranged
Individual study for qualified students. P, consent.

760 Early Childhood Education, Administration and Practicum 2-4 (On sufficient demand)
Practical experience in administration of preschool, kindergarten program. P, 223, 302, 312, 322, 333.

790 Thesis in Human Development and Family Relations 5-7 credits as arranged.

DEPARTMENT OF CIVIL ENGINEERING

Professor E. E. Johnson, Head
Associate Professors Anderson, Chang, Dornbush, Hargett, Koepsell, Shoukry

Graduate major offered: Master of Science degree with a major in Civil Engineering. Doctor of Philosophy degree with major in Civil Engineering.

Graduate minor offered: Civil Engineering.

Prerequisites for graduate study:
For the graduate major a Bachelor of Science degree in engineering or its equivalent. For the graduate minor prerequisites to the graduate courses elected.

Fields of Specialization: Highways, Structures, Hydraulics, Sanitary Engineering and Water Resources.

Civil Engineering Courses (CE)

601 Water Resources Seminar 1(1,0)
Review of literature on water resources engineering. Reading, reports and round table conferences for effective delivery of information. P, consent of instructor.

602 Industrial Waste Treatment 2(2,0)
Characteristics and composition of industrial wastes, sampling and methods of analysis of these wastes and remedial measures for treatment and disposal. P, 483 or equivalent.

603 Environmental Engineering 3(3,0)
The relationship of man's environment to his health and control of this environment from an engineering standpoint. P, consent of instructor.

610 Special Engineering Problems 1-3
Elective course for special or detailed study or investigation. P, senior standing in Civil Engineering.

623 Prestressed Concrete 3(3,0)
Theory and design of prestressed concrete including pre-tensioning and post-tensioning. P, 454.

633 Hydraulic Design 3(3,0)
Hydraulic design as applied to hydro-electric power development and turbine design, flood routing in reservoirs and natural channels, design of drainage structures and energy dissipators. P, 423.

642 Advanced Soils Engineering 2(1,3)
Application of basic soil mechanics to engineering problems. Stability, compaction, embankments, seepage, draining, and stabilization. P, 444.

643 Advanced Hydraulics 3(2,3)
Introduction to topics related to water resources engineering including: dimensional analysis, similitude, mechanics of sediment transport, river engineering, coastal hydraulics and stream channel mechanics. P, 423.

653 Water Quality Analysis 3(1,6)
The chemistry and interpretation of process control tests for the use and treatment of water and waste water. Application of test results to the design of water and waste water treatment works. P, 332 or 334.

673 Fluvial Hydraulics 3(3.0)
Erosion, transportation and deposition of sediments by flowing water, bed load and suspended load movement, river behavior and control. P, 423

683 Pavement Design 3(3,0) S
Stresses in and design of flexible and rigid pavements including subgrades, bases and sub-bases. P, 412.

713 Water Resources Engineering 3(3,0)
Advanced topics related to water resources engineering including: Multiple purpose river development, economic analysis of flood control measures, aspects of water law, advanced topics related to surface and ground water hydrology and administrative aspects of water resources planning. P, 423.

733 Advanced Indeterminate Structures 3(3,0)
Analysis of structural members of non-uniform section. Arch analysis, multilevel frameworks, column analogy, moment distribution and energy methods. P, graduate standing.

734 Advanced Structural Design 4(2,6)
Design of rigid frames, effect of plastic behavior, details for complex structures, analysis of flat plate floor systems. Design comparisons. P, graduate standing.

742 Plastic Design 2(0,6)
Modes of failure, plastic hinges, design rules and applications. P, graduate standing.

743 Elastic Stability 3(3,0)
Buckling of columns and plates. Lateral buckling of beams; stability of rings. P, graduate standing.

752 Water Treatment Plant Design 2(0,6)
Water supply sources, design of treatment plants, cost estimates of water supply systems. P, graduate standing.

753 Waste Water Treatment Plant 3(1,6)
Design of waste collection and disposal facilities, waste treatment plants, cost estimates of waste disposal and treatment systems. P, graduate standing.

754 Sanitary Engineering Laboratory 4(2,6)
Special studies of the chemical and physical aspects of the various unit processes employed in water and waste treatment and laboratory work necessary to design and operate these units. Field studies of stream sanitation, water and waste water treatment units. P, graduate standing.

763 Advanced Sanitary Engineering 3(3,0)
Advanced engineering topics related to sanitary engineering and public health, including housing, air conditioning and ventilation, air pollution, hospital and institutional sanitation, stream sanitation, waste disposal, radiological health and industrial hygiene.

773 Highway Administration and Economy 3(3,0)
Highway administration, highway and transportation costs, road user benefits, cost benefit ratio.

783 Advanced Transportation Engineering 3(2,3)
Planning and designing of railroads, highways, water and air transportation facilities and coordination of transportation facilities.

790 Thesis (as arranged)
Independent investigation of special problem and written thesis.

DEPARTMENT OF DAIRY SCIENCE

Professor J. O. Young, Head
Professors Baker, Totman (Emeritus), Voelker; Associate Professors Bartle, Spurgeon

Graduate majors offered: Master of Science degree with a major in Dairy Science.
Doctor of Philosophy degree with a major in Animal Science.

Graduate minor offered: Dairy Science.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with major work substantially equivalent to that required by this department.

For the graduate minor a Bachelor's degree including prerequisites to the graduate courses selected.

Dairy Science Courses (DS)

604 Microbiology of Manufactured Dairy Products 4(2,4) F (Offered in 1968)
Role of microorganisms in manufacture and spoilage of manufactured dairy products. P, 313. Alternate years.

613 Advanced Dairy Processing Methods 3(1,4) S (Offered in 1970)
Operations in ultra-high temperature processing of dairy products; manufacture of special types of cheese; preparation of dairy spreads; process cheese making; and other specialized dairy processing. P, consent of instructor. Alternate years.

614 Advanced Technical Control of Dairy Products 4 (2,4) S (Offered in 1969)
Chemical changes that occur during manufacture and storage of dairy products; specialized tests to detect these changes and degree thereof; significance of such changes. P, consent. Alternate years.

623 Physiology of Lactation 3(3,0) S (Offered in 1969)
Anatomy and physiology of mammary glands. Factors affecting quality and quantity of milk. P, Z 304. Alternate years.

624 Microbiology of Cultured Dairy Products 4(2,4) F (Offered in 1969)
Role of microorganisms in manufacture of lactic acid cultures, cheese and butter. P, 313. Alternate years.

701 Seminar 1(1,0) S
Problems in dairy production, dairy manufacturing, and related sciences. Maximum of 2 credits will be allowed toward either the Master of Science or Doctor of Philosophy degree.

723 Ruminology 3(3,0)
Biochemical, physiological, and microbiological activity occurring in the rumen and the relation of rumen function to animal response. P, AS 703 or consent.

761 Nutrition Seminar 1(1,0) F (Offered fall only)
Reports and discussion of current research in nutrition. Limited to 2 credits.

790 Thesis in Dairy Science (as arranged)

DEPARTMENT OF ECONOMICS

Professor John Thompson, Head
Professors Cummins (M.M.E.P.), Glover, Helfinstine, Lundy (Emeritus), Smythe; Associate Professors Aanderud, Antonides, Beck, Berry, Hsia, Lockner, Matson

Graduate majors offered: Master of Arts degree with a major in Economics.
Master of Science degree with a major in Economics, Agricultural Economics or Industrial Economics.

Doctor of Philosophy degree with a major in Agricultural Economics.

Graduate minor offered: Economics.

Prerequisites for graduate study:

A Bachelor's degree is prerequisite. A background in the social sciences and statistics is helpful, but not essential, as the department will fit the program to individual needs. Additional background, which would be helpful to the student pursuing a graduate degree in economics, would include mathematics, history, philosophy and English. An early exposure to foreign languages may be important to those contemplating further graduate work.

Economics Courses (Econ)

602 Economic Ethics 2(2,0) S (Offered in 1969)
Current economic practices examined in light of basic ethical principles. P, 6 hours in economics with one course in philosophy, preferably ethics, recommended. Alternate years.

603 Production Economics 3(3,0) S
Theory of the firm and industry, with applications in agriculture, manufacturing, and trade. Input-output relations for economic decision-making using continuous models (marginal analysis) and discontinuous models (linear programming). P, 433 or consent.

604 Econometrics 4(4,0) S (Offered in 1970)
Application of mathematical economic theory and statistical procedures to economic data; empirical testing of economic theorems. P, 314. Alternate years.

613 Economics of Modern Capitalism 3(3,0) F (Offered in 1969)
American economy as an organic entity; ownership and control of economic organizations; influence of power in economic groups; production, merchandising, pricing and financial strategies of economic groups. Positive and negative roles of government in economic regulation. P, 213. Alternate years.

622 Statistics III 2(2,0) S (Offered in 1969)
Sampling as technique in social science research, including history of sampling, design and planning of surveys, different types of sampling technique and methods of estimation, precision of estimates, and efficiency of sampling designs. P, 353. Alternate years.

623 Advanced Farm Management 3(3,0) S (Offered in 1969)
Review of management principles, including decision making and problem recognition; obtaining control of resources; organizing farm; obtaining and evaluating outlook information; administering farm or ranch; effects of income taxes; farm incorporation; father-son arrangements, field trips to well-organized farms and ranches. P, 213 and 234 or consent. Alternate years.

632 Advanced Economic Analysis 2(2,0) S (Offered in 1970)
Selected branches of microeconomics, including welfare theory and partial and general equilibrium. P, 433. Alternate years.

643 International Trade 3(3,0) S (Offered in 1969)
Factors affecting international flow of trade and balance of payments; trade controls and their influence on agricultural and domestic economy; significant current developments in trade and finance. P, 213. Alternate years.

653 Comparative Economic Systems 3(3,0) F (Offered in 1969)
Organization, operation, and comparison of various types of economic systems, such as free private enterprise system, socialism, communism, and fascism. P, 213. Alternate years.

663 Resource Economics 3(3,0) F (Offered in 1969)
Economic analysis applied to problems in conservation and development of natural resources. Effect of programs on land use. Land institutions, tenure, administration of public lands, water allocation, zoning, and alternative resource philosophies and policies. P, 213. Alternate years.

673 History of Economic Thought 3(3,0) S
Survey of economic theory; different schools of economic thought and economic environments which produced them. P, 433 or consent.

683 Agricultural Marketing 3(3,0) S (Offered in 1970)
Economic analysis of marketing problems, functions and institutions; costs and efficiency in processing and marketing; industrial structure and government roles in processing and marketing. P, 433 recommended. Alternate years.

690 Special Problems 1-3 (1-3,0) FS
Advanced work or special problems in agricultural cooperation, agricultural finance, farm management, land economics, marketing, public finance, statistics. Open to qualified seniors and graduate students by consent.

693 Economic Development 3(3,0) F (Offered in 1969)
Conditions necessary for capital formation and economic development with examination of development problem in selected area in U. S. and other countries. P, consent. Alternate years.

701 Seminar in Economics 1(1,0)
A maximum of 3 credits may be applied toward an advanced degree.

702 Research Methods 2(2,0) F
Methods, problems and principles involved in research work and sources of data for prospective research workers in economics.

703 Advanced Macroeconomics 3(3,0) S (Offered in 1969)
Modern and advanced macroeconomic models, with a view toward understanding of progress of economic growth and maintenance of high level of income and employment. Alternate years.

711 Current Theory 1(1,0) FS (Offered in 1969)
One outstanding book in current economic theory studied intensively each semester. Alternate years.

713 Theory of Markets 3(3,0) S (Offered in 1969)
Study of the relationship between the structure of markets, including firm behavioral patterns, and market performance. Determination and analysis of performance standards.

723 Economic Policy 3(3,0) F (Offered in 1968)
Relation of economic policies to basic values, technical and institutional limitational factors; role and limitations of expert and theoretical analysis. Alternate years.

790 Thesis in Economics as arranged

DEPARTMENT OF EDUCATION

Professor Stanley Sundet, Head
Professors Calkins (E.A.F.B.), Foreman, Gadda, Schultz, Wiseman (Emeritus);
Associate Professors Cochrane, Herold, Schmieding

Graduate majors offered: Master of Education degree with a major in Education, Agricultural Education, or Guidance and Counseling.
Master of Science degree with a major in Education, Agricultural Education, or Guidance and Counseling.
(See also Special Majors on page 16.)

Graduate minors offered: Agricultural Education, Education, Guidance and Counseling.

Prerequisites for graduate study:

For the graduate major in Education a Bachelor's degree including completion of the curriculum at this institution (or its equivalent) for High School General Certificate for South Dakota.

For the graduate major in Agricultural Education a Bachelor's degree including completion of the curriculum at this institution (or its equivalent) for approval as a teacher of Vocational Agriculture in South Dakota, 9 credits in general education, and a course in elementary psychology.

For either of the above majors, 8 credits of sciences and mathematics are required, and at least one year of successful teaching experience in public schools is recommended.

The graduate program in guidance and counseling is designed to provide the professional preparation, supervision, and competencies expected of qualified student personnel and guidance staff members to serve in public and private schools and in higher education positions. Graduates are also prepared to hold jobs in numerous related occupations.

For the graduate major in guidance and counseling, both a bachelor's degree and a teaching certificate is required for those preparing to be public school counselors. Mature students with a vocational commitment, or those with a goal other than public school employment, may enter the graduate degree program in guidance and counseling without meeting requirements for the High School General Certificate for South Dakota. Candidates with deficiencies may be required to take courses in guidance and psychology for undergraduate credit.

Note: Anyone who does not meet the above qualifications because of unusual circumstances may be approved for graduate study if he meets the approval of the head of the Education Department and the Associate Dean of the Graduate School.

For the graduate minor a Bachelor's degree and prerequisites for the graduate courses elected.

Agricultural Education Courses (AgEd)

600 Seminar in Agricultural Education 1-2 (1,0) or (2,0)
Specific problems dealing with instruction in vocational agriculture, project work, course of study, farm enterprise analysis, local survey. Reading and problem work. P, 453, 454, 458.

702 Adult Education in Vocational Agriculture 2(2,0) Su
Young farmer and adult farmer work. Emphasizes needs and techniques in administering and conducting adult education programs in vocational agriculture; course planning, instructional procedures, fol-

lowup and evaluation of adult classes. P, graduate student in Agricultural Education.

712 FFA and Supervised Work Experience Programs in Agriculture 2(2,0) Su

Emphasizes needs, scope, and techniques in building supervised work experience in agriculture and Future Farmer programs. P, Graduate students in Agricultural Education.

722 Curriculum in Vocational Agriculture 2(2,0) Su

For teachers and administrators of vocational agriculture. Survey of scientific studies and literature in field; principles and procedures in course building as applied to vocational agriculture. P, graduate student in Agricultural Education.

Education Courses (Ed)

602 Principles of Vocational Education and Practical Arts 2(2,0) SSu

Overview of vocational and practical arts education, their place in community school; organization and characteristics of instructional programs in agricultural, homemaking, business and industrial education. For teachers, administrators and guidance personnel. P, senior in education.

613 Educational Statistics 3(3,0) FSSu

Emphasis on meanings and interpretations and applications. Deals with data from educational and psychological measures. Exercises on tabulating and graphic representations. Required of most candidates for graduate major in education. P, graduate standing. Open to seniors.

630 Workshop in Education 1-3 Su

Workshop sessions, in several areas of education: Methods, curriculum, guidance, administration supervision and others. Generally requires 45 hours of work per credit in workshop sessions, lectures, and outside assignments. Concentrated course. Credit at rate of one credit per week. No more than 4 credits may be earned in workshop. P, experienced teachers, consent of instructor.

640 Education Seminar 1-3(1-3,0)

Review of scientific investigations of problems of education. Problems for investigation and research assigned to students. P, open to seniors and graduate students in education by permission of instructor.

J 643 Institutional Public Relations 3(3,0) SSu

(See Journalism Section.)

650 Problems in Education 1-3

Selected studies to meet needs of advanced students. P, senior standing, for seniors and graduate students desiring to do individual studies. Limited to 3 credits in graduate program. Consent of instructor.

651 Advanced Driver Education 1(1.0) Su

Traffic accident problems; survey of research studies in driver education and protection; sources of materials; measurement of driver attitudes. May be conducted as regular course or as short course involving full week (40 hours) of instruction. P, 442.

GS 662 Philosophy of Education 2(2,0) FSu

Comparison of historic and current philosophies of education, major emphasis of each, their effects upon educational goals and practices today. (May count as Education credit.)

GS 672 Improvement of Reading 2(2,0) SSu

Description of normal process of development in reading skills and techniques which may be used in remedying deviations which hinder readers in speed or comprehension. Recommended for graduate students and for undergraduates, who plan to teach. Administered by Education department.

GS 682 Diagnosis and Remediation of Reading Problems 2(2,0) Su

General nature of causes of reading disability; principles of diagnosis and use of instruments; basic principles of individual remediation; case studies; evaluation of progress of the disabled reader; adaptation of techniques to classroom. P, Ed Psy 312. Administered by Education department.

GS 692 Clinical Practice in Reading 2(1,4) Su

Supervised experience in utilizing best techniques and materials to effect desirable solution to reading difficulties; practical experience in writing case studies, in diagnosing reading disability, proposing effective remediation, keeping records and in evaluating progress of student. P, 682 or concurrent. Administered by Education department.

703 Research Methods in Education 3(3,0) FSu

Main objectives are: (a) understanding standard and new research procedures in education (b) acquaintance with up-to-date research on present-day educational problems (c) understanding and using evaluation standards for education research. Required of most graduate majors in education. P, Ed 613 or equivalent.

713 Public School Administration 3(3,0) FSu

Organization, administration and services of school systems in state, county, and local districts. Constitutional and statutory provisions. Work and responsibilities of State Board of Education, State Department of Public Instruction, County and Local Boards, and of superintendents and principals. Some attention to financial matters.

722 Organization and Administration of Elementary Education 2(2,0) SSu

Principles and modern practices of organizing and administering work of elementary schools. Required by State Department of Public Instruction of school superintendents and elementary school principals. P, Ed 713.

732 Elementary School Curriculum 2(2,0) FSu

Nature and principles of curriculum in elementary schools. Newer trends and modern curriculum development procedures.

733 Elementary and Secondary School Supervision 3(3,0) FSu

Required of School Superintendents and School Principals by State Department of Education for respective administrative certificates. Procedure for improvement of instruction in secondary and elementary school subjects.

742 Secondary School Curriculum 2(2,0) SSu
Nature and principles of curriculum in secondary schools. Newer trends and modern curriculum development procedures.

762 School Law 2(2,0) FSu
Legal character of Public Schools; legal powers of school boards, administrators, and teachers; legal aspects of parent-child-school relationships: Emphasis will be placed on South Dakota School Law. Alternates with Ed 772. P, Ed 713.

772 School Buildings and Grounds 2(2,0) SSu
Management, care and operation of school plant. Needs and evaluation of existing facilities, new buildings and remodeling. Not a technical course in design and materials. Alternates with Ed 762.

782 School Finance 2(2,0) SSu
Financing the operation of public schools; national, state, and local sources of support. Sources of revenue. Financing school building construction. Investment of surplus funds. Federal aid to education programs.

790 Thesis in Education 5-7 as arranged

792 Research Problems in Education and Agricultural Education 2(2,0)
Individual work. Problem selected, analyzed and data gathered and tested statistically. Reported in approved research form. Required of all graduate students in education qualifying for Master of Education degree under Option "A." P, graduate standing in education. Ed 613, 703, and 10 education credits.

Guidance and Counseling (GC)

600 Guidance and Counseling Workshop 2-4 cr. Su
Physical, intellectual, and social development of adolescents and their adjustment in home, school and community. P, four credits in psychology and consent of instructor. (May be counted as education credit.)

603 Group Testing 3(3,0) SSu
Study of theory and principles of construction and use of standardized measuring instruments used in educational and vocational evaluation. Practice in administration, scoring and interpretation of results. P, consent of instructor.

612 Principles of Guidance 2(4,0) FS
Purpose and scope of guidance services, including meanings, philosophy and concepts, basic elements of such service, personnel involved and organization and evaluation of guidance programs. P, senior in education. Offered first half of semester.

613 Learning Disorders of Children 3(3,0) S
Overview of various learning deficits, remedial procedures, and consideration of psychological assessments.

623 Guidance of Exceptional Children 3(3,0) F
Theory and process of guidance and counseling with the exceptional child. Identification, referral, and placement of children with pronounced differences. Methods of counseling with both children and parents. P, consent of instructor.

650 Problems in Guidance and Counseling 1-3 cr.
Directed reading and research in selected individual guidance and counseling problems. Designed to meet needs of graduate students in guidance and counseling.

703 Administration and Coordination of Guidance and Pupil Personnel Services 3(3,0) FSu
Principles of guidance; organizing school guidance program, tests and testing; guidance library and materials; interviewing and counseling. For those seeking administrative certificate.

704 Practicum in Individual Mental Testing 4(4,0) SSu
Intensive training in administration and scoring of individual mental tests; Stanford-Binet and Wechsler scales. P, Ed 613; GC 703; consent of instructor. Master's degree candidate in GC. Class limited.

722 Mental Health and Personality Development 2(2,0) SSu
Nature of personality; mental and emotional health and recognition of deviations in children and adults. Emphasis on mental health problems and positive program for personal mental health.

723 Occupational and Education Information 3(3,0) FSu
Using, reviewing, and evaluating occupational information. Sources and types of materials and occupational filing plans. Securing occupational information.

733 Individual Appraisal and Evaluation 3(3,0) F
Including the nature and range of human characteristics and methods of measuring and evaluating them. P. Consent of instructor.

742 Group Procedures in Guidance 2(2,0) SSu
Purpose and methods of group as applied to a sound guidance program. Concentration on group processes. Theoretical basis for group work in guidance, orientation activities, classroom instruction, educational and vocational planning, and group guidance. P, consent of department committee.

743 Counseling Theory and Practice 3(3,0) FSu
Theories, methods, and application of the counseling processes at all levels. P, consent of instructor.

750 Employment Service Practicum 2-4 cr. FSu
Specifically designed for employment service counselor working toward a major in Guidance Counseling. Supervised practice for employment courses. Twenty-five clock hours of supervised counseling. Written reports required. P, advanced graduate majors in Guidance Counseling and consent of instructor.

752 Seminar in Guidance and Counseling 2 (2,0) SSu
Major emphasis on research studies and evaluation of guidance counseling theory and practice. Students will investigate specific problems determined in part by needs, deficiency and interest of guidance majors. P, 20 semester credits in guidance and counseling and consent of instructor.

753 The Exceptional Child 3(3,0) FSu
Critical consideration of physical, social, emotional, and intellectual qualities which characterize children who deviate from normal to such an extent as to require special educational consideration. Special attention given to study of desirable provisions in educational program of gifted children.

760 Counseling Laboratory and Supervised Practice 3-5 (3-5,0) SSu
Counseling interviews and activities under supervision of one or more members of university staff will be conducted in counseling laboratory and field. A minimum of 25 clock hours actual counseling time required and 30 counseling tapes. In addition to laboratory and field experience, typewritten report analyzing experiences must be submitted to supervisor. P, advanced graduate majors in guidance and counseling and consent of Chairman of Counselor Education.

790 Thesis in Guidance and Counseling 5-7 as arranged

Industrial Arts Education Courses (IAE)

612 Wood Finishing 2(2,0) Su
Use of lacquers, varnishes, paints, synthetic finishes for wood. Applications such as brushes, air guns, and compressed containers. Use of all types of stains, solvents, fillers and sealers. P, Minor in IAE.

622 History of Industrial Arts 2(2,0) Su
Development of industrial arts from Russian Military Craft School through fireside crafts of the Scandinavian countries. Introduction of manual training into curriculum of education in United States and changes that resulted in our present course of exploration in various trades of today. P, minor in industrial arts.

DEPARTMENT OF ELECTRICAL ENGINEERING

Professor F. C. Fitchen, Head
Professors Gamble, Manning, Storry, Whitman

Graduate major offered: Master of Science degree with major in Electrical Engineering.

Graduate Minor offered: Electrical Engineering.

Prerequisites for graduate study:
For the graduate major a Bachelor of Science degree in engineering or its equivalent. For the graduate minor prerequisites to the graduate courses elected.

Electrical Engineering Courses (EE)

602 Biomedical Electronics 2(2,0)
Design and operation of basic biomedical electronic instrumentation. Measurement and continuous monitoring of physiological variables: EKG, body temperature, blood pressure, etc. Data acquisition, telemetry data and reduction techniques. P, 393 or 323 or consent of instructor.

603 Linear Network Theory 3(3,0)
Laplace transform theory, matrix analysis and complex variable theory as applied to problems in circuit analysis. Topology, network theorems and network functions.

610 Special Electrical Problems 1-3 (On sufficient demand)
Special problem assigned in the field of electrical engineering. P, graduate standing or consent of instructor.

612 Electrical Insulating Materials 2(2,0)
Organic and inorganic insulating materials, relation of atomic structure to properties, dielectric characteristics and measurements, life evaluation, radiation effects. P, consent of instructor.

613 Network Synthesis 3(3,0)
Modern methods of network synthesis applicable to equalizers, filters and delay lines. P, 603 or equivalent.

622 Biomedical Systems Analysis 2(2,0)
Engineering concepts applied to the study of biological systems. Modeling of representative biological systems and analysis using techniques developed in the engineering disciplines. P, 333 or equivalent.

623 Communication Theory 3(3,0) S
Information transmission, modulation, sampling theory, noise sources, introduction to statistical theory of communication. P, 333, 343.

632 Nonlinear Analysis 2 (2,0) (Offered in 1968)
Numerical, graphical and analytical methods of analysis. Singularities; systems with varying coefficients, stability of nonlinear systems, describing function methods. P, 603 or equivalent. Alternate years.

643 Microwave Theory 3(3,0) (Offered in 1969)
Transmission line theory, wave propagation, resonant cavities, waveguides, radiation and antenna theory. P, 373. Alternate years.

653 Microwave Measurements 3(2,3)
Microwave techniques, devices, transmission lines, and instrumentation P, 444.

663 Digital Logic and Switching Circuits 3(2,3) or 3(3,0)
Logic functions; design and minimization of combinational and sequential circuits. P, 323.

672 Power System Stability 2(2,0)
Inertia constant, swing-curves, equal area criterion, as applied to transient stability studies. P, consent of instructor.

673 Transistor Circuit Design I 3(3,0)
(Offered in 1968)
Analysis and design of transistor circuits with and without feedback. Gain sensitivity studies, field-effect transistor circuits. P, 343 or equivalent. Alternate years.

682 Computer Analysis of Power Systems 2(2,0)
Concepts used in formulating load flow and fault study problems for computer solution. P, consent of instructor.

683 Advanced Electromagnetic Theory 3(3,0)
(Offered in 1969)
Electromagnetic waves; Poynting vector and the flow of power; guided waves; wave guides; radiation and radiation impedence; ground wave propagation; sky wave propagation. P, 373. Alternate years.

692 Energy Conversion 2(2,0) (Offered in 1968)
Basic principles and design equations of thermoelectric and thermionic devices, magnetohydrodynamic converters, solar cells, and fuel cells. P, 454; ME 313. Alternate years.

693 Advanced Control Systems 3(3,0)
State variables in linear and nonlinear systems design. Sampled data systems, multiple input-output systems, optimization methods. P, 483 or equivalent.

700-701 Seminar 0(1,0) 1(1,0) FS
Reports and discussions of current research in electrical engineering. P, graduate standing.

713 Advanced Circuit Theory I 3(3,0) F
Application of classical mathematics to circuit response with various driving functions. P, 333.

723 Advanced Circuit Theory II 3(3,0) S
Circuit and system response with emphasis on operational methods of analysis. Heaviside's method. Laplace Transforms, Analog computer as a tool in analysis of transients. P, 713.

733 Advanced Electronics I 3(3,0) F
Pulse switching and timing circuits, signal-flow graphs, negative feedback circuits, microwaves, electronics systems engineering. P, 343.

743 Advanced Electronics II 3(3,0) S
Molecular and plasma electronics, masers and lasers, electronics systems engineering, communication theory. P, 733.

762 Symmetrical Components 2(2,0) S
Application of symmetrical components to simple three phase circuit, unloaded systems, loaded systems. Symmetrical component impedances. Use of network analyzer in analysis of symmetrical components.

773 Transistor Circuit Design II 3(3,0)
(Offered in 1969)
A continuation of EE 673 with major emphasis on new semiconductor devices, oscillators, modulators and mixers. P, 673. Alternate years.

790 Thesis in Electrical Engineering 5-7 as arranged

ENGINEERING MECHANICS (EM)

Associate Professor M. C. Singh, Administrator

Presently there is no major or minor offered in this area. The following courses are accepted as a part of the major or the minor by various departments in the college of engineering. They may also be used as supporting courses.

Engineering Mechanics Courses (EM)

EM 613 Theory of Elasticity 3(3,0)
Analysis of stress and strain; equilibrium and compatibility equations; Hooke's law; fundamental problems in the theory of elasticity; plane-stress and plane-strain problems of the narrow beam, rotating discs and a plate with a circular hole; elementary three-dimensional problems of a beam in bending and a prismatic bar under its own load; torsion of prismatic bars; energy principles and their applications. P, EM 313, Math 333, Math 393 or consent of instructor.

EM 623 Advanced Fluid Mechanics 3(3,0)
Fundamental notions of control volume, fluid stresses, and velocity field; derivation of Navier-Stokes equations of motion; analysis of potential flow theory and introduction to boundary layer theory. P, EM 323, Math 393 or consent of instructor.

EM 633 Theory of Plasticity 3(3,0)
Analysis of stress and strain; plastic behavior of materials; basic laws of plastic flow; applications to bending of beams, torsion of bars and thick walled cylinders; slip line theory and its applications to extrusion problems; limit analysis theorems and their applications to structural problems. P, EM 313, Math 333, Math 393 or consent of instructor.

EM 643 Theory of Plates and Shells 3(3,0)
Small deflection theory of plates. Laterally loaded rectangular plates. Navier and Levy solutions. Plates of various shapes, boundary conditions and loading systems. Basic equations of the theory of shells. Membrane theory applied to surfaces of revolution and quadratic surfaces. Basic equations of cylinderical shells. Analysis of open and closed cylinderical shells. Design problems in cylinderical shells. P, EM 313, Math 333, Math 393, or consent of the instructor.

DEPARTMENT OF ENGLISH

Professor Jack Marken, Head
Professors Giddings, Botting, Chang; Associate Professors Alexander, Brown, Nagle

Graduate majors offered: Master of Arts degree with a major in English.
The Master of Education degree with a major in English.

Graduate minor offered: English.

Prerequisites for graduate study:

For the graduate major a minimum of 24 semester hours of undergraduate credit in English.

For the graduate minor a minimum of 16 semester hours of undergraduate credit in English or consent of the department head.

Degree Requirements:

For both, much of the student's work is concentrated in the major area of study. In addition to this work in the major field, a minor concentration of 8 hours must be included in a field related to the major; in lieu of this requirement, 8 hours of graduate credit in two or more fields supporting the major may be substituted. For both degrees, an oral examination is required, which, in addition to being a defense of the thesis (if one is required for the degree in question), must demonstrate the candidate's comprehensive knowledge of the fields of English and American literature, as well as a more complete command of those areas in which course work has been taken at the graduate level.

The Master of Arts in English. The candidate for this degree is required to present a minimum of 30 hours of work at the graduate level, at least 20 of which must be taken in residence, to have a reading knowledge of at least one modern foreign language, preferably French or German, and to present a thesis which reports the results of individual research undertaken by the candidate under the direction of an appropriate member of the Graduate Faculty in English. The candidate for this degree is required to pass English 702 before registering for a second semester of graduate study; this requirement will be waived only under highly exceptional circumstances. Unless these or similar courses have been taken previously, English 622 and GS 602 are also required; it is strongly recommended that they be taken during the first semester of graduate study. Course offerings in the Department of English are so arranged as to permit a full-time student ordinarily to complete the degree requirements in one academic year; normally, a graduate assistant will be able to complete the requirements in two years.

The Master of Education Degree with a Major in English. Secondary school English teachers who may also direct high school dramatics and publications and who wish to prepare themselves more broadly in the language arts may elect the Master of Education. This program is open only to those who meet the requirements for state certification.

Graduate students enrolling in the Master of Education program may choose either Option A or Option B.

Option A requires:

(1) a minimum of 32 semester hours of graduate credit beyond the Bachelor's degree. Of these,
   (a) at least 22 must be taken in residence.
   (b) at least 16 semester hours must be earned in English, 4 in speech and 4 in journalism.
   (c) at least 8 semester hours must be earned in the minor field Education, courses to be determined by the Education Department.

(2) a written report based on research in the major field. (The student should register for English 710, Special Problems in Composition and Literature, for 2 hours credit.)

(3) an oral examination.

Option B requires:

(1) a minimum of 35 semester hours of graduate credit beyond the Bachelor's degree. Of these,
   (a) 25 semester hours must be taken in residence.
   (b) a minimum of 19 hours of graduate credit must be taken in English, 4 in speech, and 4 in journalism.
   (c) at least 8 semester hours must be earned in Education, courses to be determined by the Education Department.

(2) a comprehensive written examination as well as a final oral examination.

Note: Before registering for graduate work leading toward either of these two degrees, the graduate student will choose a major adviser through consultation with the Head of the English Department.

English Courses (Engl)

600 Advanced Studies in Elizabethan Literature 2-3 (2-3,0) S (Offered in 1969)
Intensive study of an area of Elizabethan literature chosen to meet the needs and interests of the students. P, senior standing and 16 hours of English, including 243 or 313. Alternate years.

610 Victorian Literature 2-3(2-3,0) S (Offered in 1969)
Intensive study of the chief writers of British poetry and prose from 1840 to 1900, with emphasis on social and intellectual developments. P, senior standing and consent. Alternate years.

620 Chaucer 2-3(2-3,0)
A study of the major works of Chaucer, with some attention to his sources and his language.

622 Development of the English Language 2(2,0) FSu
The historical development of the English language. Attention is also given to etymology and semantics.

623 Advanced Studies in American Literature 3(3,0) F (Offered in 1969)
Intensive study of selected aspects of American literature. Problems such as the development of the American novel, twentieth-century American poetry, American literary criticism, or colonial American literature will be covered in the course. P, 333-343. Alternate years.

630 Jacobean, Commonwealth, and Restoration Literature 2-3(2-3,0)
A study of the non-dramatic literature of England from the death of Elizabeth to the time of the dominance of the neo-classical tradition, excluding the works of Milton.

632 Workshop in English and Speech 2 Su
Workshop sessions in various areas of English: linguistics, composition, or literature. This is a concentrated course; it may not be taken concurrently with any other course. P, teaching experience or consent.

633 Comparative Novel 3(3,0) FSu
Selected European novels from Fielding to Camus. P, 16 hours of English or consent.

640 Elizabethan Drama 2-3(2-3,0)
English drama to the closing of the theaters in 1642, with emphasis on the plays of Shakespeare's contemporaries.

643 Milton 3(3,0) SSu
The major poems of Milton, with attention to the minor poetry and selected prose. P, 16 hours of English or consent.

650 Drama of the Restoration and Eighteenth Century 2-3(2-3,0)
English drama from the reopening of the theaters in 1660 through the time of Sheridan and Goldsmith.

653 The English Romantic Movement 3(3,0) FSu
The chief writers of English Romantic poetry and prose from 1789 to 1832, with emphasis on intellectual trends. P, 16 hours of English or consent.

660 Contemporary Drama 2-3(2-3,0)
A study of representative British and American plays from the time of Shaw to the present; some attention may be given to significant Continental plays of this era.

663 Pre-Civil War American Writers 3(3,0) SSu
A selection of writers from American transcendentalism and Romanticism. P, 16 hours of English or consent.

670 Contemporary Non-Dramatic Literature 2-3(2-3,0)
Intensive study of a selected phase, era, or type of the non-dramatic British and American literature of the twentieth century.

673 The American Realists and Naturalists 3(3,0) SSu
From Melville through the realistic and naturalistic writers at the end of the 19th century. P, 16 hours of English or consent.

680 Advanced Studies in Early English Literature 2-3(2-3,0) F (Offered in 1968)
Intensive study of a phase of English literature of the era before 1550. P, senior standing and 16 hours of English, including 243 or 313. Alternate years.

683 Advanced Shakespeare 3(3,0) SSu
Intensive study of selected plays of Shakespeare and significant Shakespearean criticism. P, 243 or 262 or 313 or consent.

690 Special Studies in Composition and Literature 1-3(1-3,0) FSSu
Special studies in various areas of writing, grammar, and literature. May be repeated to total 4 credits. Given only with the permission of the Head of the Department of English.

693 English Literature of the Neo-Classical Period 3(3,0) SSu
Neo-classical literature from Dryden to Samuel Johnson, with attention to the intellectual, social, and political influences at work. P, 16 hours of English and consent.

702 Graduate Survey of English and American Literature 2(2,0) F
The student is expected to acquire a knowledge of English and American literature which will provide a satisfactory basis for continued graduate work.

712 Modern American Throught 2 (2,0) FSu
Analysis of selected economic, social, and philosophical ideas of the late 19th and 20th centuries, their relationship to selected segments of American life, and their reflection in American literature. P, consent.

723 Problems in Teaching Composition and Literature 3(3,0) SSu
Analysis of problems encountered in teaching composition and literature, and examination of teaching techniques.

773 Literary Criticism 3(3,0) S
The tradition of literary criticism from Plato to the present.

790 Thesis 5 credits. P, GS 602.

DEPARTMENT OF ENTOMOLOGY-ZOOLOGY

Professor Walstrom, Head
Professors Hartwig, Hugghins, Kirk, Stoner (USDA), George (USDA);
Associate Professors Greb, Hamilton (USDA), McDaniel, Ortman (USDA), Swanson

Graduate majors offered: Master of Science degree with major in Entomology.
Master of Science degree with major in Zoology.
(See also Master of Education degree program with major in Biological Science, page 16.)
Doctor of Philosophy degree with major in Entomology.

Prerequisites for graduate study:

For the graduate major in Entomology a Bachelor's degree with at least 14 credits in entomology. (Biology may be included in these credits.)

For the graduate major in Zoology a Bachelor's degree with at least 14 credits in zoology.

For the graduate minor in Entomology a Bachelor's degree with at least 6 credits in entomology and prerequisites to the graduate courses to be taken.

For the graduate minor in Zoology a Bachelor's degree with at least 6 credits of zoology and prerequisites to the graduate courses to be taken.

Note: Deficiencies in the prerequisites for graduate study may be made up during the first year of graduate study, without graduate credit.

Entomology Courses (Ent)

600 Entomology Research Problems 2-6 credits
Qualified students may investigate special entomological problems under supervision of members of departmental staff. Arrangements must be made with supervising staff member prior to registration. Undergraduate students limited to 2 credits. P, cumulative grade point average of at least 2.75 plus permission of supervisor.*

613 Insect Anatomy 3(2,2) F
Detailed anatomy of insects: integument, appendages, sense organs, and organ systems of representative larval, nymphal and adult forms. Consideration given to structural variation, embryology, and evolutionary relationships. P, Ent 103 or its equivalent.

623 Insect Physiology 3(2,2) S
Fundamental physiological processes in insects. Normal and abnormal functioning of adult and immature stages, developmental physiology, physiology of behavior. Ch 134 and permission of instructor.

643 Insect Ecology 3(2,2) S (Offered in 1970)
Comprehensive study of insects in relation to their environment. Effects of microclimate and macroclimate on predators, parasites, disease, reproduction, development and feeding habits of insects. Techniques for determining various factors important to survival and reproduction in the insect's environment. P, Ent 103, Ent 313, Z 302. Alternate years.

*A total of not more than 6 credits in any combination of courses Ent 600 and Ent 700 may be counted toward requirement for the M.S. degree.

700 Taxonomy of Insect Groups 2-6 credits FS
Taxonomic study of groups of insects. Student prepares report in which he gives technical description, and other information, of group under study. P, Ent 313.*

701 Graduate Seminar in Entomology 1(1,0) FS
Reports and discussions of topics of entomological interest. Maximum of 3 credits accepted for M.S. degree. P, graduate status. (Major students required to attend all seminar sessions.)

702 Insectary Methods 2(1,2) F (Offered in 1969)
Methods of rearing insects under laboratory, greenhouse, and screenhouse or caged conditions; includes techniques of mass production of insects for use in biological control of insect pests. Alternate years.

703 Insect Toxicology 3(2,2) S (Offered in 1969)
Comprehensive study of insecticides and chemosterilants, their effects, antidotes, detection, and uses. The techniques of determining insecticide resistance in an insect population, insecticide residues, and radio-active tracers in laboratory and field populations. P, Ent 402, Ent 623, Ch 134. Alternate years.

790 Thesis in Entomology 5-7 credits for M.S. degree as arranged. Credits for Ph.D. degree to be determined by committee.

Zoology Courses (Z)

600 Zoological Research Problems 2-6 credits FS
Qualified students may investigate special zoological problems under supervision of members of departmental staff. Arrangements must be made with supervising staff member prior to registration. Undergraduate students limited to 2 credits. Graduate students limited to 6 credits. P, cumulative grade point average of at least 2.75 plus permission of supervisor.

602 Human Genetics 2(2,0) SSu (Offered in 1969)
Subject matter of fundamental human heredity; to serve the specialist such as physician, nurse, public health worker, social worker, etc., and general student. Basic principles used as they pertain to genetics of man. P, Bio 303. Alternate years.

604 Comparative Vertebrate Embryology 4(2,4) F
Development of germ cells, fertilization. Early cleavage, segmentation and organogenesis in Amphioxus, frog, chick and pig. P, Bio 113, 123.

612 History and Philosophy of Zoology 2(2,0) F (Offered in 1969)
Early zoologists and their contributions to science. Controversial theories of past and their influence on growth of science of zoology; their relationship to modern zoological concepts. Biographies and works of great zoologists. P, Bio 113, 123. Alternate years.

614 Endocrinology 4(3,3) F (Offered in 1969)
A study of the effects of the secretions of the various glands of the body on the growth, development, metabolism, and reproduction of domestic animals. P, Z 304. Alternate years.

654 Mammalian Anatomy 4(2,6) F
Detailed dissection of cat as representative mammal. Comparisons with human body (skeleton, models, charts) given special attention. All systems are dissected and studied. For those students who need more comprehensive and detailed course in anatomy than is available in Z 203. P, Bio 113, 123.

664 Advanced Systemic Physiology 4(3,3) F
Various systems of the animal body; coordination and inter-relationships of systems; circulation, temperature regulation, muscle, and respiration. P, Z 304.

674 Advanced Systemic Physiology 4(3,3) S
Physiology of digestion, rumination, urine formation, reproduction, nervous system, endocrine glands, and special senses. P, Z 304.

701 Graduate Seminar in Zoology 1(1,0) FS
Reports and discussions of topics of zoological interest. Maximum of 3 credits accepted. P, graduate status.

703 Developmental Genetics 3(3,0) F (Offered in 1969)
Chemical nature of the gene and its chemical and physical action in development. P, Bio 113, 123, Bio 303 and Ch 134. Alternate years.

713 Helminthology 3(2,2) S (Offered in 1970)
Comprehensive study of worm parasites of vertebrate animals and of soil and plant nematodes. Morphology, taxonomy, life cycles, ecological relationships, and control methods are discussed. Techniques of collecting, preparation, and identification. P, Bio 113, 123, Z 324. Alternate years.

790 Thesis in Zoology 5-7 credits, as arranged FSSu

GENERAL STUDIES

Courses in General Studies are offered as follows. There is no major or minor, and the various courses are taught by various departments. The courses are accepted by many departments as a part of the major or the minor, and the courses may be used as supporting courses in a degree program.

General Studies Courses (GS)

602 Research Tools in the Humanities 2(2,0) F
Survey of research and reference materials of special value and interest to students of Humanities. Acceptable for major or minor credit in Economics, English, History, Political Science and Rural Sociology.

662 Philosophy of Education 2(2,0) FSu
Comparison of historic and current philosophies of education, major emphasis of each, their effects on educational goals and practices today (may count as education credit).

672 Improvement of Reading 2(2,0) SSu
Description of normal process of development in reading skills and techniques which may be used in remedying deviations which hinder readers in speed or comprehension. Recommended for graduate students and for undergraduates who plan to teach. Administered by Education department.

682 Diagnosis and Remediation of Reading Problems 2(3,0) Su
General nature of causes of reading disability; principles of diagnosis and use of instruments; basic principles of individual remediation; case studies; evaluation of progress of the disabled reader; adaptation of techniques to classroom. P, Ed Psy 312. Administered by Education department.

692 Clinical Practice in Reading 2(1,4) Su
Supervised experience in utilizing best techniques and materials to effect desirable solution to reading difficulties; practical experience in writing case studies, in diagnosing reading disability, proposing effective remediation, keeping records and in evaluating progress of student. P, 682 or concurrent. Administered by Education Department.

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

Professor Stanley Marshall, Head
Professor Ginn; Associate Professors Huether, Robinson; Assistant Professor Crabbs

Graduate majors offered: Master of Science degree with a major in Physical Education.
Master of Education degree with a major in Physical Education.

Graduate minor offered: Physical Education.

Prerequisites for graduate study:
For the graduate major a Bachelor's degree with a major in Physical Education or its equivalent, and prerequisites to the courses to be pursued.
For the graduate minor a Bachelor's degree with an undergraduate minor, or equivalent in Physical Education, and prerequisites to the courses to be pursued.

Physical Education Courses (PE)

602 Physical Education for the Elementary School 2(2,0) Su
Analysis of activities, materials, techniques, and methods used in conduct of physical education for elementary grades. Progression in curriculum planning in areas of rhythm, games, self-testing, and tumbling. P, permission of department head. Graduate or undergraduate credit.

651-661-671 Workshop in Health, Physical Education, and Recreation 1 credit Su
Workshop sessions in specific areas taught by department. Lectures, conferences, committee work and outside assignments. P, permission of department head, graduate or undergraduate credit.
651 Health Education
661 Movement Education
671 Outdoor Education

702 Advanced Problems in Administration of Interschool Athletics 2(2,0) Su
Budgets, public relations problems, subsidization, objectives of athletics, staff organization, control of athletics, both interscholastic and intercollegiate, and general policies of athletics. P, graduate standing, permission of staff.

703 Advanced Evaluation in Health, Physical Education, and Recreation 3(3,0) FSu
Advanced techniques for evaluating outcomes of physical education. Practice in test performance and administration. Some laboratory work may be required. P, graduate standing, permission of staff.

713 Philosophy of Physical Education 3(3,0) SSu
Discussion and analysis of major philosophic contributions to physical education. Formation and evaluating one's belief concerning physical education. P, graduate standing, permission of staff.

722 Problems in Health and Safety Education 2(2,0) FSu
Methods of health instruction; problems of health service; problems in supervision of health environment; recent trends and problems in safety education. P, graduate standing, permission of staff.

723 Analysis of Methods of Teaching Physical Education and Athletics 3(2,2) SSu
Analysis of natural and formal methods. Demonstrations and study of methods applied to various activities. P, graduate standing, permission of staff.

732 Psychology of Physical Education and Athletics 2(2,0) SSu
Psychological principles, theories and law applied to physical education and athletic situations. Interpretation of behavior in sports. P, graduate standing, permission of staff.

733 Physiology of Exercise 3(3,0) SSu
Body processes as they relate to exercise; efficiency of muscular work; fatigue and exercise; age, sex, and body type as related to exercise; nervous control of muscular activity; effect of exercise on the circulatory system. P, graduate standing, permission of staff.

742 Advanced Problems in Organization and Administration of Community Recreation 2(2,0) SSu
Problems related to equipment; establishing programs; budget and finance; selecting and supervising staff; public relations activities. P, graduate standing, permission of staff.

752 Supervision of Health and Physical Education 2(2,0) Su
Techniques, principles, organization and philosophy of supervision in this field. P, graduate standing, permission of staff.

762 Basic Issues in Health, Physical Education and Recreation 2(2,0) Su
Directed reading in recent literature in field; discussion of current problems; critical analysis of recent research. P, graduate standing, permission of staff.

Seminar in Health, Physical Education and Recreation 2(2,0) Su
Courses designed to offer current information on subjects of interest in field.

772 Scientific Basis of Physical Education 2(2,0) Su

782 Mechanical Analysis of Motor Skills 2(2,0) Su

773 Current Trends in Athletics 3(2,1) Su only
For men who are experienced in the coaching profession. Lectures, demonstrations, and visual aids will be used to give students the latest developments in the field of football, basketball, wrestling, baseball, and track coaching. P, one year coaching experience.

783 Research Methods in Health, Physical Education and Recreation 3(3,0) FSu
Methods and techniques of research in field, critical analysis of master's and doctor's thesis practice of research techniques. P, graduate standing, permission of staff.

790 Thesis in Physical Education 5-7 as arranged

793 Individual Research and Study in Health Education, Physical Education and Recreation 3 credits FSSu
Special problems by individuals. Results of study presented in special reports and term papers. P, major in this field.

DEPARTMENT OF HISTORY AND GEOGRAPHY

Professor W. R. Kenny, Head
Professors Sewrey, Volstroff

Graduate major offered. (See Master of Education degree program with a major in Social Science, page 16.)

Graduate minors offered: History.

Prerequisites for graduate study:
For the graduate minor a Bachelor's degree with minor in History.

History Courses (Hist)

603-613 European Economic History 3(3,0) FS
Topics for History 603 to include manorialism, capitalism, the commercial revolution, and mercantilism and colonialism. History 613 will stress the Industrial Revolution, economic causes and consequences of World War I, Capitalism vs Communism, and current economic problems of the European nations.

623-633 European Intellectual History 3(3,0) FS
A history of litertaure and the arts, leading cultural and ideological movements of Western man from the Renaissance to the present. History 623 will stress the 16th, 17th and 18th centuries while History 633 will deal primarily with the main currents of European thought in the 19th and 20th centuries.

643 History of Russia 3(3,0) F
From the earliest times to present, with special emphasis on background and history of Communist regime; treats cultural and social as well as political aspects.

653-663 American Diplomatic History 3(3,0) FS
Rapid survey of period to 1898; more comprehensive treatment of present century of American diplomacy.

670 Special Problems in History 2-3-4 credits FSSu
Selected studies to meet needs of advanced students.

673-683 Cultural History of United States 3(3,0) FS
Major social and intellectual trends and movements in the United States during the nineteenth and twentieth centuries.

693 Europe in the 19th Century 3(3,0) FSSu
Europe in the period 1815-1914. This course will concentrate on the emerging power struggle in Nineteenth Century Europe, the race for world empire, forces leading up to the outbreak of World War I as well as the scientific, cultural and artistic achievements of the age.

710 Seminar in History 1-2 credits
Studies in selected history fields, arranged according to demand.

Geography Courses (Geo)

614 Advanced Study in Land Utilization 4(4,0) S
An intensive examination of the physical and cultural factors affecting the nature and pattern of land utilization. Local and regional problems will be studied in detail.

624 Advanced Regional Studies in Geography: Africa, Asia and the Pacific Areas 4(4,0) F
Advanced study of selected topics in regional geography.

HOME ECONOMICS

Professor Hettler

No major or minor is offered in this area. The following course may be used in the major or minor as a supporting course in the graduate program.

701 Seminar in General Home Economics 1(1,0) (On sufficient demand)
Reports and discussions of contribution of land-grant institutions to higher education and development of home economics.

DEPARTMENT OF HOME ECONOMICS EDUCATION

Professor Lilyan K. Galbraith, Head
Professor McArthur (Emeritus); Associate Professor Johnston

Graduate majors offered: Master of Science degree with a major in Home Economics Education.
Master of Education degree with major in Home Economics Education.

Graduate minor offered: Home Economics Education.

Prerequisites for graduate study:
For the graduate major a Bachelor's degree with a major in Home Economics and prerequisites to courses to be taken in home economics and education.
For the graduate minor a Bachelor's degree including no less than 16 credits in home economics and prerequisites to the courses elected.

Home Economics Education Courses (HEd)

612 Trends in Home Economics Education 2(2,0) (On sufficient demand)
Trends in family life education, with emphasis on their effect on teaching in high school classes or youth groups, such as 4-H clubs. P, 432 and CD 322 or equivalent.

630 Problems in Home Economics Education 1-4 (On sufficient demand)
Investigation of problems selected from Home Economics Education fields, such as adult education, evaluation, space and equipment and trends in home economics. P, open to students with qualifications for problem.

700 Seminar in Home Economics Education 1-2 (On sufficient demand)
Review and discussion of current literature in home economics education. Required of all graduate students in home economics education.

702 Supervision in Home Economics Education 2(2,0) (On sufficient demand)
Programs in home economics studies with special emphasis on supervised student teaching: Roles of state supervisor, city supervisor, student teaching supervisor, and student teachers analyzed. Opportunity to work on individual problems. P, teaching experience and consent of staff.

712 Curriculum in Home Economics Education 2(2,0) (On sufficient demand)
Curriculum in secondary schools of South Dakota and other states. New ideas developed. P, 432 or equivalent.

722 Evaluation in Home Economics Education 2(2,0) (On sufficient demand)
Methods and techniques used in evaluating programs in homemaking. Evaluation instruments developed. P, 432 or equivalent.

740 Research Problems in Home Economics Education 2-3 as arranged
Required of graduate students qualifying for master's degree without writing thesis. (See procedure on page 10 through 11.) Problem selected in some area of Home Economics Education. Problem analyzed, data gathered, treated statistically and reported in approved form.

790 Thesis in Home Economics Education 5-7 credits

DEPARTMENT OF HORTICULTURE-FORESTRY

Professor R. M. Peterson, Head
Associate Professors Collins, Prashar

Graduate major offered: Master of Science degree with a major in Horticulture.

Graduate minor offered: Horticulture.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in agriculture and the prerequisites to subjects pursued.

For the graduate minor a Bachelor's degree with courses in botany, entomology, and other subjects related to the work taken in horticulture.

Horticulture Courses (Ho)

600 Horticulture Problems 1-2 FS
Special investigation for graduate students. Maximum of four hours credit. Open as elective to selected undergraduates.

643 Horticultural Crop Breeding 3(2,2) S (Offered in 1969)
Application of principles of genetics and cytology to improvement of horticultural crops. P, Z 303. Alternate years.

731 Graduate Seminar 1(1,0)

732 Experimental Horticulture 2(2,0) S
Principles, methods, equipment, organization and application of horticultural research. P, graduate standing.

790 Thesis in Horticulture 5-7 FS

DEPARTMENT OF MANAGEMENT, HOUSING, AND EQUIPMENT

Associate Professor Hecke, Acting Head

No major or minor is offered in this department. Graduate level courses are, however, offered and these may be applied to other degree programs in the College of Home Economics with approval of the major adviser. They may also be used as supporting courses.

Management, Housing, and Equipment Courses (MHE)

600 Seminar in Home Management 1(1,0) (On sufficient demand)
Review and discussion of current literature in various areas of home management.

612 America's Housing 2(2,0) F (Offered in 1967)
America's housing as affected by following factors: history; philosophy; tradition; climate; geographical area; population; local, state, and federal laws; and financing. P, 273 and consent of instructor. Alternate years.

630 Special Problems 1-4 (On sufficient demand)
Opportunity offered for special study in Home Management and Equipment. P, consent of instructor.

DEPARTMENT OF MATHEMATICS

Associate Professor J. E. Richards, Acting Head
Professors Engebretson, Kranzler, MacDougal, Milic, Walder, Wente;
Associate Professor Scholten

Graduate majors offered: Master of Science degree with a major in Mathematics.
(See also Master of Education degree program with major in Physical Science, page 16.)

Graduate minor offered: Mathematics.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with a major in mathematics or the equivalent.

For the graduate minor a Bachelor's degree with prerequisites to the subjects elected for graduate study.

Mathematics Courses (Math)

603 Numerical Analysis 3(3,0) S
Finite differences, interpolation, summation of series, approximation of functions, numerical solution of systems of algebraic equations, numerical differentiation and integration. P, 333.

613 Theory of Probability 3(3,0) (On demand)
Axiomatic development of probability, random variables and their probability distributions with emphasis on the binomial and Poisson distributions; random walks, Markov chains and discrete stochastic processes. P, 314 or 413.

623-633 Advanced Calculus 3(3,0) FS
Infinite series, elliptic integrals, Fourier series, multiple integrals; line, surface and space integrals, ordinary differential equations, Bessell functions, partial differential equations, vector analysis, and probability. P, 254.

643 Partial Differential Equations 3(3,0) S
Series, solutions, total differential equations, simultaneous equations, approximate solutions, partial differential equations of first and second orders, application. P, 333.

644 Complex Variables 4 (4,0) F
Algebra of complex numbers, classifications of functions, differentiation, integration, mapping transformations, and infinite series. P, 254.

653 Vector Analysis 3(3,0) S (On demand)
Vector algebra, vector functions, vector calculus with emphasis on various physical applications. P, 254.

770-780 Advanced Topics in Mathematics
1-2 (1-2,0) FS
Selected topics in mathematics to fit needs of graduate student. Limited to total of three credits. P, consent of staff.

790 Thesis in Mathematics 5-7 as arranged

DEPARTMENT OF MECHANICAL ENGINEERING

Professor J. F. Sandfort, Head
Professor Covert; Associate Professors Eno, Wnuk

Graduate major offered: Master of Science degree with a major in Mechanical Engineering, Master of Science degree with an Industrial Engineering option, Master of Science degree in Industrial Economics.

Prerequisites for graduate study:
For the graduate major a Bachelor of Science degree in engineering or its equivalent. For the graduate minor prerequisites to the graduate courses elected.

Mechanical Engineering Courses (ME)

600-601 Seminar 0(1,0) 1(1,0) FS
Reports and discussions of current research in mechanical and industrial engineering.

610 Special Problems (1-5) (on sufficient demand)
Provides an opportunity for study or investigation of special problem or project at graduate level. P, graduate standing or consent of instructor.

633 Quality Control and Reliability 3(3,0)
(On sufficient demand)
Fundamentals of probability and distribution theory with application to various branches of engineering. Application of statistical techniques to the control of quality and the development of economical inspection methods. Collection, analysis, and interpretation of operations data; control charts and sampling procedures; relationships between experimental measurements of variance. Application of statistical methods for life and reliability analysis in product design, production, and procurement. P, 403 or consent of instructor.

643 Introduction to Operations Research 3(3,0)
(On sufficient demand)
History and organization of operations research, mathematics in industrial decisions, evaluating production alternatives, waiting lines, linear programming techniques, replacement, sequencing, incremental and total value analysis. Simulation, Input-output models. Basic concepts of PERT. P, 403 or consent of instructor.

653 Advanced Metallurgy 3(3,0)
(On sufficient demand)
Continuation of Course 383. Methods of metallurgical examination and mechanical testing. Heat treating and surface hardening methods and techniques. Elasticity, plasticity, structure of alloys, high temperature metals. P, 383.

663 Gas Dynamics I 3(3,0) (On sufficient demand)
Objectives, applications and scope of the subject. Methods of fluid dynamics and thermodynamics. Compressible flow in ducts, nozzles and diffusers. Propagation of plane waves, shock dynamics, characteristics, interaction of waves. General theorems of gas dynamics. P, 333, EM 323.

673 Advanced Engineering Thermodynamics 3(3,0)
(On sufficient demand)
Review of classical thermodynamics. Principles of kinetic theory and classical statistical mechanics. Principles of quantum mechanics, quantum statistics, partition functions, and thermodynamic properties. Application of statistical thermodynamics to gases, liquids, and solids. Chemical systems, fluctuations, and irreversible thermodynamics. P, 333; Math 393 or consent of instructor.

692 Advanced Analytical Methods 2(2,0)

Collocation and interpolation, Hermite method, the least squares procedure. Orthogonalization and Bubnov-Galerkin treatment. The variational approach, minimum energy principle and Ritz method, Trefftz approach to the Dirichlet and Neumann-boundary value problems. Poincare or "small parameter" method and its modifications. Linear vector spaces and approximation in Hilbert Space. Formulation and solution of finite difference equations. Infinite series approach. Introduction to integral equations. P, Math 623 or equivalent.

693 Topics in Reliability Engineering 3(3,0)
(On sufficient demand)

Probability concepts and typical models involved in the statistical prediction of reliability. Methods for estimating the required parameters from experimental data. Applicability of reliability and maintainability techniques in practice and a survey of recent developments in the field. P, 633 or consent of instructor.

703 Decision Theory 3(3,0) (On sufficient demand)

Examination and evaluation of modern techniques of decision making. Mathematical models and measurement theory. Certainty, risk and uncertainty. Prediction and optimal decisions. Game theory. Simulated decision making.

713 Systems Analysis 3(3,0) (On sufficient demand)

Analysis of industrial problems as systems, having properties of input, processing, output, feedback and control. Application of systems techniques for isolating and identifying industrial problems in areas such as production, organization, engineering, and research. Case studies to illustrate use of modern electronic digital computers in design of systems. P, graduate standing and consent of instructor.

733 Advanced Machine Design 3(3,0)
(On sufficient demand)

Stress analysis, elastic energy theory, photoelasticity, curved beams, thin plates and shells, torsion, fatigue and stress concentration. P, 434; graduate standing.

763 Advanced Heat Transfer I 3(3,0)
(On sufficient demand)

Presentation and discussion of Fourier's Conduction Law. Derivation of the general heat diffusion equation. Advanced analytical methods of solutions of boundary value problems of steady and unsteady heat conduction and multi-dimensional heat conduction. Solutions for problems with distributed or transient point, line or plane heat sources. Numerical and analogic techniques for problem solutions and discussion of radiative heat transfer and some problem solutions by network and determinant techniques. Some discussion of space applications of radiation heat transfer. P, 343; Math 393 or consent of instructor; graduate standing.

773 Advanced Heat Transfer II 3(3,0)
(On sufficient demand)

Presentation of equations of motion for viscous fluids. Derivation of energy equation for viscous fluids. Analyses of hydrodynamic and thermal boundary layers for forced and free convection. Heat and momentum transfer analogies. Some exact and some approximate analytical solutions. Consideration of some special topics such as boiling, condensation and ablation and transpiration cooling. P, 343; Math 393 or consent of instructor; graduate standing.

783 Gas Dynamics II 3(3,0)

Continuation of Gas Dynamics I. Treatment of two-dimensional and axially symmetric bodies in subsonic, supersonic, and hypersonic flow. Development of Continuity, Motion and Energy equations for each flow regime with subsequent solution for velocity and pressure distributions by appropriate perturbation methods and application of certain linearization theories. Consideration of both idealized isentropic flows and presence of oblique shocks. P, 663.

790 Thesis in Mechanical Engineering 5-7 as arranged.

DEPARTMENT OF NUTRITION AND FOOD SCIENCE

Professor E. Hollen, Head
Associate Professors Wills, Schneider

Graduate major offered: Master of Science degree with a major in Nutrition and Food Science.

Graduate minor offered: Nutrition and Food Science.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with major work substantially equivalent to that required by this department.

For the graduate minor a Bachelor's degree including prerequisites to the graduate courses elected.

Nutrition and Food Science Courses (NFS)

630 Special Problem in Food and Nutrition
2-4 credits as arranged

Special study in food and nutrition. P, consent of instructor.

700 Seminar in Food and Nutrition
1-2 credits as arranged (On sufficient demand)

Reports and discussion of current literature in various areas of food and nutrition. P, consent of instructor.

703 Human Nutrition: Energetics, Lipids, and Carbohydrates 3(3,0) (On sufficient demand)
Emphasis on lipids and carbohydrates in human nutrition and the role of food stuffs, body composition and other controlling factors in energy metabolism.

723 Human Nutrition: Proteins, Minerals and Vitamins 3(3,0) (On sufficient demand)
The study of proteins, amino acids, minerals, and vitamins in human nutrition with emphasis on functions and metabolism.

753 Techniques in Nutrition Research 3(1,6) (On sufficient demand)
Laboratory experience using methods, measurements, and instruments for obtaining nutritional data. P, Ch 324 or consent of instructor.

763 Food Science: Processing 3(3,0) (On sufficient demand)
Methods of food processing and the resulting chemical and physical changes that affect the eating quality and nutritive value of food.

773 Food Science: Distribution and Consumption Trends 3(3,0) (On sufficient demand)
Distribution problems, legislation, world food outlook and consumption trends.

790 Thesis in Nutrition and Food Science 5-7 credits as arranged

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

Associate Professor G. W. Omodt, Head
Professor LeBlanc

Graduate major offered: Master of Science degree with a major in Pharmaceutical Chemistry.

Graduate minor offered: Pharmaceutical Chemistry.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in Pharmacy or its equivalent.
For the graduate minor a Bachelor's degree with prerequisites to graduate courses elected.

Pharmaceutical Chemistry Courses (Pha)

602 Health Physics 2(2,0)
Theoretical and practical aspects of radiation protection, hygiene, control, and safety. Production, detection, monitoring, and control of radiation exposure in medical and research applications.

603 Bionucleonics 3(3,0) FS
Theory and techniques for application of radioactive and stable isotopes to biological research.

611 Bionucleonics Laboratory 1(0,3) FS
Laboratory application of isotope technique to biological research. P, 603 or taken concurrently.

704 Advanced Drug Analysis 4(2,6) F
Drug analysis employing types of industrial laboratory apparatus. Offered on sufficient demand.

712 Advanced Drug Analysis 2(1,3) S
Continuation of 704. On sufficient demand.

714 Advanced Pharmaceutical Chemistry 4(3,3) F
Chemistry of organic compounds used as therapeutic agents with emphasis on synthesis and structure-activity relationships. Laboratory synthesis of organic medicinals. Offered on sufficient demand.

715 Advanced Pharmaceutical Chemistry 5(3,6) S
Continuation of 714. On sufficient demand.

741-751 Seminar 1(1,0) FS
Required of all graduate students taking majors in the College of Pharmacy. (Alternate years.)

790 Thesis in Pharmaceutical Chemistry 5-7

DEPARTMENT OF PHARMACOGNOSY

Professor K. Redman, Head

Graduate major offered: Master of Science degree with a major in Pharmacognosy.

Graduate minor offered: Pharmacognosy.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in Pharmacy or its equivalent.
For the graduate minor a Bachelor's degree with prerequisites to graduate courses elected.

Pharmacognosy Courses (Pha)

703 Microscopy of Foods and Drugs 3(2,3)
Microscopic structure and characteristics of powdered drugs and foods with methods of identification of adulterants. Offered on sufficient demand.

741-751 Seminar 1(1,0) FS
Required of all graduate students taking majors in the College of Pharmacy. Offered on alternate years as required.

790 Thesis in Pharmacognosy 5-7 as arranged

DEPARTMENT OF PHARMACOLOGY

Associate Professor B. E. Hietbrink, Head

Graduate major offered: Master of Science degree with a major in Pharmacology.

Graduate minor offered: Pharmacology.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in Pharmacy or an allied science.
For the graduate minor a Bachelor's degree with prerequisites to graduate courses elected.

Pharmacology Courses (Pha)

713-723 Pharmacology 3(1,6)

Theories of drug action and techniques used in pharmacological research and testing. P, 534. Offered on sufficient demand.

741-751 Seminar 1(1,0) FS

Required of all graduate students taking majors in the College of Pharmacy. Offered on alternate years as required.

790 Thesis in Pharmacology 5-7 as arranged

DEPARTMENT OF PHARMACY

Professor R. E. Hopponen, Head
Professor LeBlanc

Graduate major offered: Master of Science degree with a major in Pharmacy.

Graduate minor offered: Pharmacy.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in Pharmacy or its equivalent.
For the graduate minor a Bachelor's degree with prerequisites to graduate subjects desired.

Pharmacy Courses (Pha)

612 Manufacturing Pharmacy 2(1,3) FS

Use of equipment similar, on a pilot plant scale, to that used in industry and to give experience in quantity production of formulations. P, 444.

733 Product Formulation 3(0,9) F or S

All dosage forms of medication with emphasis on formulation of preparations suitable for quantity production in Manufacturing Pharmacy 612. P, 612.

741-751 Seminar 1(1,0) FS

Required of all graduate students taking majors in the College of Pharmacy. Offered on alternate years as required.

790 Thesis in Pharmacy 5-7 as arranged

DEPARTMENT OF PHYSICS

Professor H. M. Froslie, Head
Professors Duffey, Graetzer, Miller, Williams; Assistant Professor Sippel

Graduate majors offered: Master of Science degree with a major in Physics.
(See also Master of Education degree program with a major in Physical Science, page 16.)

Graduate minor offered: Physics.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree with a major in Physics or its equivalent.
For the graduate minor a Bachelor's degree with a minor in Physics or its equivalent.

Physics Courses (Phy)

633 Reactor Physics 3(3,0) S

Fission process: moderation and diffusion of neutrons; critical equation for homogenous and heterogenous reactors; reactor control and reactivity changes. Pertinent demonstrations using subcritical reactor. P, 403 or 373, Math 333 and consent of instructor.

650 Physics Colloquium 1(1,0) 0(1,0) FS

Reports and discussions of current research within department and in field of physics. Participation primarily by staff and graduate majors. Open for undergraduate credit by special arrangement.

653 Plasma Physics 3(3,0)
Elementary processes in a plasma, trajectories of charged particles, collective effects, creation of plasma, plasma instabilities, applications. P, 413.

703 Theoretical Mechanics 3(3,0) F
Further development of Lagrangian and Hamiltonian methods, canonical transformations, rigid body motion, relativistic mechanics. P, 354.

713 Tensors and General Relativity 3(3,0)
Covariance in physics, basic tensor algebra and calculus, affine connections, the Riemann tensor, field equations, linear approximations, the Schwarzchild solution. P, 703.

723 Electrodynamics 3(3,0) S
Complex quantities, circuits, Maxwell's equations, waves in general, planar, cylindrical, and spherical waves, approximation methods, plasmas. P, 413.

732 Statistical Mechanics 2(2,0)
Derivations of Bolzmann distribution law, Bose-Einstein statistics, Fermi-Dirac statistics, basic theory of gas and liquid states, order-disorder phenomena, the partition function. P, 703.

743 Theory of the Solid State 3(3,0)
Selected topics for advanced treatment from such areas as crystal structure, lattice dynamics, band theory, semiconductors, and ferromagnetism. P, 443.

753 Theoretical Nuclear Physics 3(3,0)
Quantitative treatment of the intrinsic properties of nucleons and the nucleon-nucleon interaction; consideration of current nuclear models and interpretation of scattering of nucleons in terms of these models. P, 403.

763 Advanced Quantum Mechanics 3(3,0) F
Hermitian operators, matrix methods, perturbation theory, Dirac wave equation, four-fermion interactions. P, 354, 364.

783 Group Theory in Quantum Mechanics 3(3,0) S
Symmetry transformations, continuous groups, finite groups, applications to valence theory, Lorentz group, fundamental particles. P, 763.

790 Thesis in Physics 5-7 as arranged. FS

DEPARTMENT OF PLANT PATHOLOGY

Professor C. M. Nagel, Head
Professor Semeniuk; Associate Professors Buchenau, Mankin

Graduate majors offered: Master of Science degree with a major in Plant Pathology.
Doctor of Philosophy degree with a major in Plant Pathology.

Graduate minor offered: Plant Pathology.

Prerequisites for graduate study:
For the graduate major a Bachelor's degree with a minimum of 20 credits in the biological and physical sciences including botany, zoology, and chemistry
For the graduate minor: Bachelor's degree with prerequisites to the graduate courses selected.

Plant Pathology Courses (Path)

603 Fungus Physiology 3(2,2) F (Offered in 1968)
Nutritional and other requirements of fungi, including plant pathogens, for growth and reproduction; their intermediate metabolism and elaboration of chemical by-products. P, 424, Bac 202-212. Alternate years.

620 Special Problems 1-2 FS
Advanced work or special problems in plant pathology. Credit arranged but limited to total of 4 credits for three terms. Open to seniors and graduate students by permission.

634 Plant Nematology 4(2,4) F (Offered in 1968)
Nematode diseases of plants with emphasis on collection, isolation, preservation, symptomology, life histories, identification and control of plant parasitic nematodes. P, 234, Bio 113, 123. Alternate years.

691 Seminar 1(1,0) S
Discussion of current research topics in plant pathology. Limited to one credit for B.S. degree and three credits for graduate degree.

724 Plant Virology 4(2,4) S (Offered in 1970)
Virus diseases in plant with emphasis on nature and physical properties of virus, development of virus within host, symptom expression on plant, host range and variability between and within virus groups. Preparation and presentation of reports on pertinent topics. P, 404. Alternate years.

725 Bacterial Phytopathology 5(2,6) F
(Offered in 1968)
Detailed study of etiology and epiphytology of representative bacterial diseases emphasizing biology and control of pathogen. Preparation and presentation of reports on pertinent topics. P, 404. Alternate years.

745 Mycology 5(2,6) F (Offered in 1968)
Advanced taxonomy of fungi. P, 424. Alternate years.

755 Mycology 5(2,6) S (Offered in 1969)
Advanced taxonomy of fungi. P, 424. Alternate years.

772 Phytopathogenesis 2(2,0) F (Offered in 1969)
Fundamentals of infection and disease development, disease susceptibility or resistance of host, and how disease affects host development. Preparation and presentation of reports on pertinent topics. P, 404 and 424. Alternate years.

783 Phytopathogen Variability 3(3,0) S
(Offered in 1970)
Variability in plant pathogens and related microorganisms as this contributes to our understanding of incidence of development of disease resistant strains of crop plants. Preparation and presentation of reports on pertinent topics. P, 404 and 424, Bio 303.
790 Thesis as arranged

DEPARTMENT OF POLITICAL SCIENCE

Professor J. P. Hendrickson, Head

Graduate major offered: (See Master of Education degree program with a major in Social Science, page 16.)

Graduate minors offered: Political Science.

Prerequisites for graduate study:
For the graduate minor a Bachelor's degree with minor in Political Science.

Political Science Courses (PolS)

Consent required of those students not majoring or minoring in PolS.

613 International Politics 3(3,0) F
How nation states behave and why they behave as they do in their relations with each other. Attention is given to contemporary U. S. foreign policy.

623 International Law and Organization 3(3,0) S
System of rules purporting to regulate conduct of nation-states and development of machinery of international cooperation with particular reference to United Nations.

633 Administrative Law 3(3,0) S
Judicial control of administrative activity. Case method.

643 Administrative Principles and Practices 3(3,0) S
A comprehensive analysis of the field of public administration from the standpoints of human behavior, institutional functions, and the administrative process.

663-673 History of Political Thought 3(3,0) FS
PolS 663 study of enduring political ideas from Plato to the 18th century; PolS 673 political thought of the last three centuries with emphasis on democracy and its critics.

683 The Federal System 3(3,0) F
Conflict, cooperation and changing relationships between levels of government in the United States.

670 Special Problems in Political Science
1-2-3(1-2-3,0) FSSu
Individual guided research culminating in formal research paper.

710 Seminar in Political Science 1-2-3(1-2-3,0)
Studies in selected Political Science fields.

DEPARTMENT OF PRINTING AND JOURNALISM

Professor G. H. Phillips, Head
Professor Markland; Associate Professor Wentzy; Assistant Professor Jess

Graduate majors offered: Master of Arts degree with a major in Journalism.
Master of Science degree with a major in Journalism.

The Graduate major in journalism is intended to meet the needs of (1) those who teach communications courses in high school, who have school public relations responsibilities, or who supervise school publications; and (2) professional journalists who wish to broaden their education in communications and social sciences.

Three courses outside the department of journalism are accepted toward the major, depending upon the program of the individual student. They are Sp 612 Persuasion, GS 702 Modern American Thought, and PM 632 Advanced Typographical Design.

Because journalism is largely an interdisciplinary subject, most courses are open to students from other fields without prerequisites.

Master of Science degree with major in Printing Management.

The graduate major in Printing Management is intended to serve the needs of (1) teachers of printing who wish advanced work in graphic arts and (2) those in the industry who wish to prepare themselves more adequately for executive positions in management.

Courses from other departments which may be counted toward the major in Printing Management include Econ 602 Economic Ethics, ME 633 Quality Control and Reliability, Ed 602 Principles of Vocational Education and Practical Arts, and J 642 Institutional Public Relations.

Graduate minors offered: Journalism. Printing Management.

Prerequisites for graduate study:

For the graduate major in Journalism a Bachelor's degree with 16 credits in communications plus one year of experience in journalism or a related field (teaching of journalism or public information work will be accepted here).

For the graduate major in Printing Management a Bachelor's degree with a major in Printing Management or its equivalent.

For the graduate minor in Journalism a Bachelor's degree with 16 credits in communications, of which 3 must be in newswriting or advanced English or speech composition.

For the graduate minor in Printing Management a Bachelor's degree with 20 credits in printing and completion of an appropriate trade school course or two years of experience in the trade or in the teaching of printing.

Journalism Courses (J)

632 Supervision of School Publications 2(2,0) Su (S alternate years, 1970)
School yearbooks, newspapers and problems of secondary school journalism education. Open.

640 Workshop in School Publications 1-3 credits Su

643 Public Relations 3(3,0) SSu
Interpreting institutional and industrial policies and programs to the public. Open.

653 Public Opinion and Propaganda 3 (3,0) FSu
Formation and measurement of public opinion; the role of the mass media; propaganda techniques, agencies, theories.

Sp 660 Special Problems in Radio, Television, and Film 1-2 credits

672 Rights and Responsibilities of the Press 2(2,0) S
Nature and history of the rights and responsibilities of the press; the relation of the press to individuals and society. Analysis of court cases involving the First and Fourteenth Amendments to the Constitution. Open.

Sp 673 Educational Radio and Television 3(3,0) Su

713 Research Methods in Communications 3(3,0) FSu
Survey of major research in communcations, study of methods employed; elementary statisical procedures.

720 Special Problems 1-3 credits FSSu
Individual research problem. Consent of instructor.

733 Theories of Communication 3(3,0) S
Examination of major theories of information transfer and communication channels. Open.

742 Seminar in Current Editorial Problems 2(2,0) S

790 Thesis in Journalism 6 credits FSSu

Printing Management Courses (PM)

612 Labor Problems 2(2,0) S
Intensive study of labor negotiations, contracts and labor-management relations in the industry. P, 363 or equivalent.

623 Graphic Arts Education 3(3,0) FSu
Investigation of labor market trends and labor force composition changes which affect manpower needs in the industry. Case studies and problem solving in the area of matching labor supply with industry needs through educational adjustment.

632 Advanced Typographical Design 2(2,0) S
Important typographers and their works; principles of graphic design, classical and modern; Morris and the classical revival; American designers; book and periodical design. P, consent.

643 Advanced Lithography 3(2,3) F
Advanced problems in lithographic techniques and trouble shooting; color separation; quality control instruments. P, 244 or equivalent.

652 Trends in Graphic Reproduction 2(2,0) S
Current problems in the industry, including those being studied in laboratories and research centers; automation, computers, materials. P, 472 or equivalent.

J 713 Research Methods in Communications 3(3,0) FSu
(see Journalism listing)

J 720 Special Problems 1-3 credits FSSu
(see Journalism listing)

733 Production Management 3(3,0) F
Division of labor, lines of control, responsibility, supervisory techniques; tooling and logistics. P, 353 or equivalent.

743 Production Control 3(3,0) S
Time and motion studies, operations research, lines of flow; analysis of cost factors in production; case studies. P, 463 or equivalent.

782 Seminar in Printing Management 2(2,0) F
Directed investigation and research in selected problem areas in printing technology and management.

790 Thesis in Printing Management 6 credits FSSu

DEPARTMENT OF PSYCHOLOGY AND PHILOSOPHY

Professor Leo Subotnik, Head

Presently there is no major or minor offered in this area. The following courses are accepted as part of the major or minor by various departments. They may also be used as supporting courses.

Psychology Courses (Psy)

623 Adolescent Psychology 3(3,0) FSu
Physical, social, emotional, intellectual and vocational aspects of adolescent development. Emphasis given to increasing understanding of adolescents and their problems. P, 203.

650 Problems in Psychology 1-3 credits
Opportunity for qualified students to investigate special problems or carry out independent study, under supervision of department staff. P, adequate background and consent of supervising staff member.

DEPARTMENT OF RURAL SOCIOLOGY

Professor Howard M. Sauer, Head
Professors Chittick, Dimit, Kroeger, Riley

Graduate Majors offered: Master of Arts degree with a major in Sociology.
Master of Science degree with a major in Sociology.
Doctor of Philosophy degree with a major in Sociology.
(See also Master of Education degree program with major in Social Science on page 16.)

Prerequisites for graduate study:
For the graduate major a Bachelor's degree with 24 credits in the social sciences of which 16 credits must be in sociology.
For the graduate minor a Bachelor's degree, including prerequisites for the graduate courses elected.

Rural Sociology Courses (RS)

612 Social Thought 2(2,0) F (Offered in 1969)
Brief survey of history and development of world's most important social theories and schools of social thought, evaluated in light of present knowledge. P, 153, 393. Alternate years.

622 Social Disorganization 2(2,0) S (Offered in 1970)
Analysis of conditions and factors which result in personal and institutional disorganization, including mental disorders, suicide, alcoholism, delinquency, and disruption of family and community life. P, 153. Alternate years.

633 Leadership and Group Organization 3(3,0) S (Offered in 1970)
Emergency and types of leadership in group situations; analysis of leader-follower roles, functions and relationships in groups, and organizations. P, 153, and consent of instructor. Alternate years.

653 Social Systems 3(3,0) F (Offered in 1968)
Social organizations and institutions as systems of social interaction having common elements which permit analysis and understanding of structure and functioning of society. Relevant concepts from sociological theory will be introduced in building an analytical framework. P, 153, 202. Alternate years.

672 Social Institutions 2(2,0) F (Offered in 1969)
Pivotal institutional fields with special reference to major social institutions such as: religious, economic, political, educational and familial. P, 153, 393.

683 Social Change 3(3,0) S (Offered in 1970)
Theories concerning factors and processes in social-cultural change. Consideration of various interpretations of social-cultural change in terms of stages, cycles, and trends. P, 153, 393.

690 Special Problems in Sociology 1-3(1-3) FSSu
Advanced work or special problems in such areas as population, marriage and family, rural sociology, criminology, social disorganization or urban sociology. P, open to seniors and graduate students with sufficient background.

703 Research Methods in Sociology 3(3,0) S (Offered in 1969)
Use of scientific method in sociological research; basic tools of research design; some special applications of statistical techniques to social data. P, 153, 393, and Econ 353 or Ed 613. Alternate years.

713 Sociological Theory I 3(3,0) F (Offered in 1968)
Critical examination of the main schools of sociological theory beginning with the system of Auguste Comte and ending with World War II. P, 153, 393. Alternate years.

723 Sociological Theory II 3(3,0) S (Offered in 1969)
Sociological theories from World War II to present. P, 153, 393. Alternate years.

780 Seminars in Sociology 1-4 as arranged

790 Thesis in Sociology as arranged

DEPARTMENT OF SPEECH

Professor Stine, Head
Professor Markland: Associate Professors Denton, Hoogestraat

Graduate majors offered: The Master of Arts degree with a major in Speech.
The Master of Education degree with a major in Speech.

Graduate minor offered: Speech.

Prerequisites for graduate study:

For the Master of Arts degree with a major in Speech: a minimum of 24 semester hours of undergraduate credit in Speech.

For the Master of Education degree with a major in Speech: a minimum of 18 semester hours of undergraduate credit in Speech and sufficient courses in education to meet state certification requirements.

For the graduate minor in Speech: a minimum of 16 semester hours of undergraduate credit in Speech or the consent of the department head.

Those students who do not meet the above prerequisites may consult with the Head of the Department of Speech concerning arrangements for removal of deficiencies. Before registering for graduate work leading toward a master's degree with a major in speech, the student must consult the Head of the Department of Speech who will assign an advisor.

Degree requirements. The required curriculum for the Master of Arts degree with a major in Speech consists of a minimum of 22 semester hours in Speech including 5-7 hours in Speech 790, and electives approved by the adviser to bring the combined total to not less than 30 semester hours. A reading knowledge of a foreign language and satisfactory completion and approval of a thesis based on appropriate research are also required.

The Master of Education degree with a major in Speech has been established to meet the needs of secondary school and junior college teachers of Speech. The requirements for the major are the same as those for other Master of Education degree programs. The coursework is done primarily in the department of Speech and must include at least 4 credits in English and at least 4 credits in Journalism. The minor is taken in education. Either Option A or Option B may be used for this program.

Speech Courses (Sp)

612 Persuasion 2(2,0) SSu
Audiences, motivation, principles of attention and suggestion, bases of belief and action applicable in persuasive speaking. Theory and practice. P, 323. Alternate years, spring and summer.

613 Directing Speech Activities 3(3,0) SSu
Organizing and directing declamation, dramatic, and forensic programs. Alternate years, spring and summer.

622 Development of the English Language 2(2,0) FSu
(See English Section.) May count toward Speech Major.

630, 640, 650, 660 Special Problems in Speech 1 to 2 cr. FSSu
Directed research. May be repeated for total of 6 credits. P, 16 credits in speech or graduate standing and consent of department head.

630 Public Address or Speech Education 1-2 credits

640 Theatre or Interpretation 1-2 credits

650 Speech Correction or Audiology or Practicum 1-2 credits

660 Radio, Television, and Film 1-2 credits

632 Workshop in English and Speech 2 Su

633 Rhetorical Theory 3(3,0) FSu
Historical development of rhetorical theory from classical to modern times. Alternate years, fall and summer.

653 Dramatic Literature 3(3,0) SSu
Intensive study of historical drama to Ibsen. Alternate years, spring and summer.

663 History and Criticism of American Public Address 3(3,0) FSu
Critical evaluation of American speakers from Colonial to contemporary period. P, consent of instructor. Alternate years, fall and summer.

673 Educational Radio and Television 3(3,0) Su
Educational broadcasting with practical work in the preparation and presentation of educational and instructional materials for radio, television, and film and their use in the classroom. P, consent of instructor.

J733 Theories of Communication 3(3,0) FSu
(See Journalism Department.) May count toward a Speech Major.

790 Thesis 5-7 credits FSSu

DEPARTMENT OF TEXTILES AND CLOTHING

Associate Professor A. Hsia, Head
Professors Lund, Rosenberger (Emeritus)

Graduate major offered: Master of Science degree with a major in Textiles and Clothing.

Graduate minor offered: Textiles and Clothing.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree in Home Economics with major work in textiles and clothing or related work.

For the graduate minor a Bachelor's degree with prerequisites to the graduate courses selected.

Textiles and Clothing Courses (TC)

610 Special Problems in Textiles and Clothing 1-4 credits

Problems for advanced study selected according to student's specific interests, needs, or current research with which student is unfamiliar. Credit arranged by professor in charge.

700 Seminar in Textiles and Clothing 1-2 credits

Reports and discussion of current literature in various areas of textiles and clothing.

703 New Developments in Textiles 3(3,0) Su (Offered in 1969)

Recent developments in fibers and textile products. Chemical and physical properties of fibers, yarns, fabric structure and finishes. P, consent of instructor. Alternate years.

713 Costumes and Textiles Through the Ages 3(3,0) (On sufficient demand)

A survey of the evolution of apparel arts from ancient to modern times emphasizing aesthetic, social, political, and economic factors affecting dress and mores expressed through dress in each culture. P, 343.

790 Thesis in Textiles and Clothing 5-7 as arranged

DEPARTMENT OF WILDLIFE MANAGEMENT

Associate Professor D. R. Progulske, Head
Associate Professor Linder

Graduate major offered: Master of Science degree with major in Wildlife Biology.

Graduate minor offered: Wildlife Biology.

Prerequisites for graduate study:

For the graduate major in Wildlife Biology a Bachelor's degree with at least 14 credits in the area of wildlife conservation and closely allied biological fields.

For the graduate minor in Wildlife Biology a Bachelor's degree with at least 6 credits in the wildlife area and prerequisites to the graduate courses to be taken.

Deficiencies in the prerequisites for graduate study may be made up during the first year of graduate study, but will not apply to the graduate program.

Wildlife Techniques and Conservation Courses (WL)

600 Wildlife Research Problems 1-2 credits as arranged FS

(Limited to 2 credits for B.S. degree; limit of 2 credits for M.S. degree)

Qualified students may investigate special wildlife problems under supervision of departmental staff. Arrangements must be made with supervising staff member prior to registration. P, cumulative grade point average of at least 2.75 plus permission of supervisor.

603 Fisheries Science 3(2,3) F

Specific taxonomy and life histories, distribution, environmental requirements, habits, species interrelationships, population statistics, economic and recreational importance of species. P, WL 313, 404.

613 Advanced Wildlife Management 3(2,3) S

Taxonomy, life histories, distribution, environmental relationships, and management of big game and upland game species. Regional management practices of the major big game mammals of North America. P, Z 313; WL 313, 404.

623 Animal Ecology 3(1,6) FSu 1969

Composition of environment and relationships of animals to their surroundings. Impact of ecological forces upon animals and responses elicited are examined in the field. P, Z 302. (Alternate summers)

624 Limnology 4(2,6) SSu 1968

Analysis of physical, chemical, and biological characteristics of lakes, ponds, and streams and factors

and processes that operate in fresh waters as dynamic systems. Methods of measuring and evaluating influences affecting aquatic life in fresh waters. P, Bot 424. (Alternate summers)

701 Wildlife Seminar 1(1,0) FS

Reports and discussions of current topics in wildlife research and management. Not more than 3 credits may be applied toward the graduate degree.

703 Wetlands Management 3(2,3) F

Depletion and preservation of wetland areas during past and present years. Economic and recreational importance of wetlands. Need for coordinating land-use policies of various federal and state governmental agencies. Federal and state legislation as it relates to wetland management. Ecological analysis of wetland areas in eastern South Dakota. P, Z 313; WL 313, 324, 404.

724 Aquatic Ecology 4(2,6) F

Qualitative and quantitative measurements of aquatic populations including primary and production and biomasss. Interrelationships of biotic and abiotic components of aquatic ecosystems. Productivity and factors affecting rates of transfer of energy and matter with aquatic communities will be stressed.

790 Thesis in Wildlife 5 Cr.

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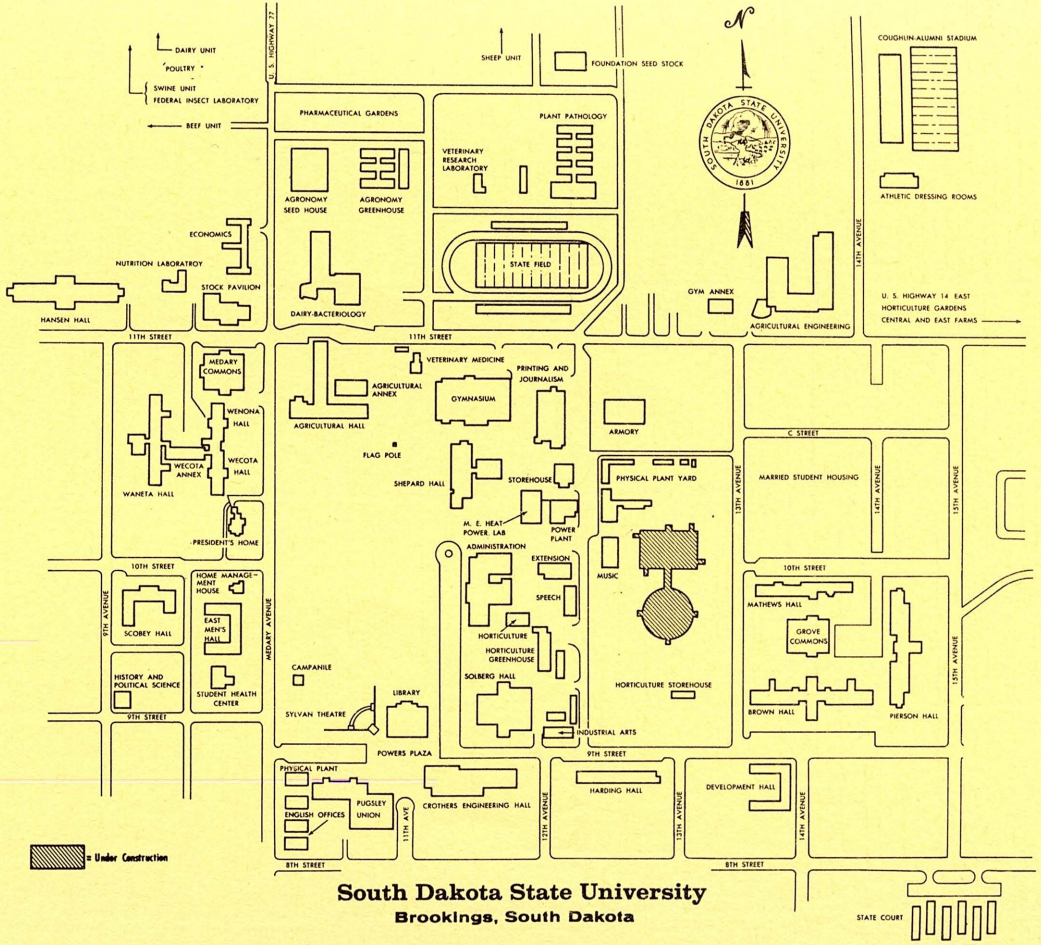

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Brookings, South Dakota

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