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THE
GRADUATE
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BROOKINGS
BULLETIN

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72-'73 Calendar

1972-73 ACADEMIC CALENDAR

1972 FIRST SEMESTER

- Aug. 28, 29, Mon., Tues.—Registration
 Aug. 30, Wed.—Beginning of classes
 Sept. 4, Mon.—Labor Day, Holiday
 Sept. 13, Wed.—Last day to add or drop a course and adjust fees
 Sept. 29, Fri.—Last day to submit graduation card
 Oct. 9, Mon.—Pioneer's Day, Holiday
 Oct. 10, Tues.—Monday classes
 Oct. 14, Sat.—Hobo Day
 Oct. 23, Mon.—Veteran's Day, Holiday
 Oct. 25, Wed.—Monday classes
 Nov. 7, Tues.—Last day a course may be dropped without a grade
 Nov. 22, Wed.—Thesis due, Graduate office
 Nov. 22, Wed.—Classes close, 5:20 p.m., Thanksgiving
 Dec. 5, Tues.—Last day, Final orals
 Dec. 12, Tues.—Corrected theses due, Graduate Office
 Dec. 16, Sat.—Graduation, 2 p.m.
 Dec. 18, 19, 20, 21, 22, Mon., Tues., Wed., Thurs., Fri.—Semester Examinations
 Dec. 27, Wed.—Grades due at noon

1973 SECOND SEMESTER

- Jan. 8, 9, Mon., Tues.—Registration
 Jan. 10, Wed.—Beginning of classes
 Jan. 23, Tues.—Last day to add or drop a course and adjust final fees
 Feb. 9, Fri.—Last day to submit graduation card

- Feb. 19, Mon.—Washington's Birthday, Holiday
 Mar. 2, Fri.—Classes close, 5:20 p.m. Recess
 Mar. 12, Mon.—Classes resume
 Mar. 23, Fri.—Last day to drop a course without a grade
 April 11, Wed.—Theses due, Graduate Office
 April 19, Thurs.—Monday classes
 April 19, Thurs.—Classes close at 5:20 p.m., Easter
 April 24, Tues.—Last day, Final orals
 April 24, Tues.—Classes resume
 May 1, Tues.—Corrected theses due, Graduate Office
 May 5, Sat.—Graduation, 10 a.m.
 May 7, 8, 9, 10, 11, Mon., Tues., Wed., Thurs., Fri.—Examinations
 May 14, Mon.—Grades due, 5:00 p.m.

1973 SUMMER SESSION

- June 6, Wed. a.m.—Registration, 8 a.m. to 12 noon
 June 6, Wed. p.m.—Beginning of classes, 1 p.m.
 June 29, Fri.—Graduation cards due
 July 4, Wed.—Holiday
 July 6, Fri.—Theses due, Graduate Office
 July 18, Wed.—Last day, Final orals
 July 26, Thurs.—Corrected theses due, Graduate Office
 July 31, Tues.—Classes close, 4:20 p.m.
 July 31, Tues.—Graduation, 7:30 p.m.

The Graduate School Bulletin

SOUTH DAKOTA STATE UNIVERSITY
 BROOKINGS, SOUTH DAKOTA 57006

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NOTICE—Due to conditions which may arise beyond the control of South Dakota State University, statements in this catalog may be changed during the next year without notice. In so far as possible courses listed and approved by the Regents of Education will be offered, but the University reserves the right to modify any statement in accordance with finances and other unforeseen conditions.

THE GRADUATE BULLETIN

South Dakota State University—Brookings, South Dakota

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JUNIS O. STORRY, Dean, College of Engineering, Director of Engineering Experiment Station, Professor of Electrical Engineering; Ph.D., 1967, Iowa State University.
R. MILTON RICH, Coordinator of General Extension Service; M.S., 1949, South Dakota State University.
STANLEY A. SUNDET, Director of Summer School and Director of Placement, Professor of Education; Ph.D., 1955, University of Minnesota.

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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 of seven members elected from the Graduate Faculty assists the Dean and Associate Dean in the administration of the school. The council includes: The Graduate Dean (chairman); the Associate Dean (Secretary); two members from biological science; two members from physical science; two members from social science; and one member from education. 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 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 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 material on undergraduate programs and for general information concerning South Dakota State, refer to the General Catalog. Information concerning summer school is published in the Summer Session Bulletin which may be obtained from the Graduate Office or from the Office of Student Services.

PURPOSES

The Graduate school provides an atmosphere for qualified students to obtain rigorous advanced education in a variety of fields in preparation for service and leadership in their professions and society. It also promotes scholarly pursuits and scientific research for the advancement of knowledge within a climate of freedom of inquiry.

ACCREDITATION

South Dakota State University is a land-grant university and as such subscribes to the land-grant philosophy of education, research, and extension as its three-fold mission. The graduate school is a separate administrative unit composed of selected scholars within the university.

The graduate program of South Dakota State is accredited through the Doctoral degree by the North Central Association of Colleges and Secondary Schools, the regional accrediting agency for 19 states including South Dakota. The Graduate School is a member of the Council of Graduate Schools in the United States.

The departments of Agricultural, Civil, Electrical, and Mechanical Engineering 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

Students taking work beyond the Bachelor's degree, whether or not they intend to work for an advanced degree may be classified as graduate students. Before enrolling

in any graduate course, they must be admitted to the Graduate School. (The exception to this is a student with a Bachelor's degree who enters school to take undergraduate work. For this, admission is obtained through the Office of Student Services.)

To apply, a form supplied by the Graduate Office must be submitted to that office 15 days prior to the opening of the term. With the application, the following must be provided:

1. One official transcript of undergraduate coursework. This applies to graduates of South Dakota State as well as to graduates of other institutions. However, South Dakota State 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 must be filed with the application. A complete 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 students.
3. A report of physical examination. This is required of all students except those taking not over 8 credits per semester, or those enrolled as undergraduates at South Dakota State during the previous year.
4. Two letters of recommendation from persons acquainted with the academic ability of 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. 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 enroll in GS 123, English for Foreign Students, during their first semester.

Note: Students from foreign countries should file their applications at least four months in advance of registration.

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 Services and the Office of the Registrar.

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 in which the advanced degree will be taken.

Transient Application

Students expecting to enroll in a limited number of courses (not over 10 hours) and who do not expect to work toward a degree, may use the transient application form. This procedure does not require a transcript nor payment of the application fee. Certification of Completion of a Bachelor's degree from an accredited institution is required, however.

Admission Without Condition

An applicant may be admitted without condition if he has completed a Bachelor's degree, satisfactorily completed all undergraduate prerequisites for his major and minor fields of study, and had an average grade of "B" (3.0 or higher on a 4-point grading system (A = 4, B = 3, C = 2, D = 1), during the last two academic years of undergraduate 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 undergraduate study. Admission is provisional until the Bachelor's degree is granted. (Provided a 3.0 or higher grade point average is maintained for the last two years.)

2. The applicant lacks prerequisite undergraduate courses specified by the major department. Admission is provisional until these courses have been completed without graduate credit and to the satisfaction of the department.

3. The applicant has a low grade point average between 2.4 and 3.0 for his junior-senior years.

A student admitted provisionally must remove any provisions as soon as possible. Departments will assign advisers to such students. Failure of a student to do satisfactory graduate work at any point in his program is sufficient grounds for dismissal or reclassification as a nondegree or Special student.

Students with a junior-senior grade point average below 2.75 and who have pass-fail (or equivalent) grades shall have instructors for such courses furnish letter grades or furnish satisfactory G.R.E. scores.

Nondegree Admission

Students not meeting the above admission requirements, those enrolled only in evening or Extension classes, those not working toward a degree or transient students may be granted admission and take courses as nondegree or special students.

Students with nondegree or Special student status may request and be granted a change in status to work toward a degree provided 10 credits of graduate work have been completed with grades of "B" and provided the student enrolls full time in on-campus courses. Generally no more than 10 credits under nondegree or Special student status may be applied toward a degree. Any change in this status will have to be approved by the department concerned and the Associate Dean.

Nondegree or Special students may not be granted Graduate Assistantships nor enroll for thesis credits. The Associate Dean will act as adviser for these students.

Change of Status

Students admitted provisionally or as Special students (nondegree) may request a change of status after satisfactorily completing 10 hours or more of graduate work. This request should be submitted to the Graduate School, after which it will be submitted to the appropriate department for a recommendation.

However, students admitted as Special students (not working toward a degree), while taking Extension courses, may not have their status changed until they come on campus as full-time students.

Readmission

Students formerly enrolled as graduate students at South Dakota State (not enrolled the previous semester) 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 to 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 may request permission from the Associate Dean to take 600 and 700 level courses for graduate credit. Such permission requires the student to have a grade point average of 2.5, or a junior-senior grade point average of 3.0 or better, not enroll for more than 18 credits (9 credits during summer school), and the course or courses are

not required for the Bachelor's degree. Forms for requesting permission 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 seven credits of course work per semester. Two credits may be carried during the Summer Session. Not more than 12 credits may be carried during the calendar year. Staff will pay matriculation and application fee if courses are taken for credit.

Permission to enroll 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 Student Services, 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.

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. Inquire of 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 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 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.

Students in guidance and counseling may be required to present 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 in the semester schedule available prior to each registration. Graduate students report to the Graduate Office as the first step of their registration, to receive further instructions.

Normal and Maximum Credit Loads

The normal credit load per semester during the academic year is 12 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, except 10 for students with a G.P.A. of 3.25 or higher). 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).....	18.00
°Tuition per credit hour (non-residents).....	36.00
General University fee per semester. Includes laboratory fees, health fee, Student Union fee. Union fee (\$10.50) optional for graduate assistants on contract)	24.00
Student Association fee per semester (optional for graduate assistants on contract)	23.50
Extension courses: Tuition per credit hour (S. Dak. resident).....	16.00
(nonresident).....	25.00

Summer Sessions:

The same fees apply to Summer Session except the General University fee is \$1.30 per credit with a minimum of \$4.00 and the Student Association fee is \$4.

Other Fees:

Late registration fee: A late registration fee of \$10 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 \$18 per credit for residents and \$36 per credit for non-resident. 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 or Master of Science degree is presented to the Graduate Office in final form, a \$5 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 \$20 to cover the cost of microfilming the thesis and publishing the abstract in "Microfilm Abstracts."

Registration for Thesis 790, Section II. All graduate students who have completed the thesis credits specified on their Plans of Study are required to register and pay tuition for Thesis 790, Section II, each semester (including Summer) until they complete their thesis. The number of credits for which to register will be determined by the Graduate Dean in consultation with the appropriate Department Head.

FINANCIAL AND OTHER INFORMATION**Fellowships and Assistantships**

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

Obligation Incurred in Accepting an Assistantship

The Graduate School of South Dakota State, as a member of the Council of Graduate Schools in the United States, subscribes and adheres to the following resolution regarding scholars, fellows, trainees, and graduate assistants: In every case in which a graduate scholarship, fellowship, traineeship or graduate assistantship for the next academic year is offered to an actual or prospective graduate student, the student, if he indicates his acceptance before April 15, will have complete freedom through April 15 to submit in writing a resignation of his appointment in order to accept another scholarship, fellowship, traineeship, or graduate assistantship. However, an acceptance given or left in force after April 15 commits him not to accept another appointment without first obtaining formal release for the purpose.

*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.

Housing for Graduate Students

Prospective graduate students should inquire about rooms or apartments of the Director of Student Housing, well in advance of registration.

Living Costs

Living costs, including tuition and fees, for the single resident graduate student are estimated to be \$2,000 to \$2,500 per academic year. Travel costs are not included.

Graduate Courses During Summer Sessions

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

Credit Restriction for Workshops

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

Credit Restriction for Problems Courses

No more than four credits in problems courses may be counted toward the Master or Arts, Master of Science or Master of Education degree. No more than six credits of problems courses (beyond the Bachelor's degree) may be counted toward the Doctor of Philosophy degree.

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

Graduate students usually register for thesis credit during several semesters. However, thesis advisers may give only an incomplete grade (I) each term in which the student enrolls for thesis credit until satisfactory completion of the thesis and final oral examination. The thesis adviser, upon satisfactory completion of the thesis and final oral, will then give a satisfactory grade (E) for all thesis credit by notifying the Office of Student Services. If not satisfactory a grade of unsatisfactory would be given.

Filing a Graduation Card

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

Scholastic Requirements

No credit is given toward a graduate degree for any grade below "C" in 600 or 700 level courses, or "B" in 300 or 400 level courses. In addition, all work in the major must average "B" (3.0) and all work in the minor or in supporting courses must average "B" (3.0). Grades for transfer courses are not used in calculating these grade point averages.

A graduate student must attain a "B" average (3.0) in all 600-700 level courses taken and 300, 400 and 500 level courses used in his graduate program taken from South Dakota State University.

Cap, Gown, and Hood Rental

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

Attendance at Commencement

All students are expected to participate in the Commencement exercises at which a 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 explaining the need for being absent. The President will notify the candidate if the request is approved.

Extension and Evening Students

Graduate students enrolling in Extension or evening classes will be admitted as non-degree students. Those students having less than a 2.4 junior-senior grade point average should not expect to earn a graduate degree, unless they demonstrate exceptional competence in their graduate work (G.P.A. of 3.25 or higher).

Furthermore, students cannot complete all requirements for a degree with Extension and evening classes. A minimum of one semester of full-time on-campus work will be required.

Outdating of Course Work

Courses taken more than six years prior to completion of the Master's degree are considered outdated. Credit for courses taken more than six years before completion may be applied to a Master's only if the course is repeated, or if an examination covering the material is certified as passed by appropriate faculty member.

The rules of the Graduate School in effect at the beginning of the seventh year following admission to work toward a Master's degree will apply if the degree has not been granted by then.

Transfer of Credits

Graduate credits earned at other institutions may be applied toward the Master's degree. Such credits must be approved for transfer by the student's adviser and by the Associate Dean. Usually this is done at the time a Plan of Study is approved. Such transfer for a Master's degree is limited to 7 credits in the major and 3 credits in the minor or supporting course area.

Credits for transfer courses are allowed only if a grade of "B" or better was earned, the course is not outdated, and an official transcript is furnished.

Degrees and Fields of Study

South Dakota State offers the Master of Science, the Master of Arts, the Master of Education, and the Doctor of Philosophy degree. 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 Engineering	Entomology
Agronomy	Home Economics Education
Animal Science	Journalism
Bacteriology	Mechanical Engineering
Biology	Physical Education
Chemistry	
Civil Engineering	Plant Pathology
Dairy Science	Rural Sociology
Economics	Wildlife Biology
Electrical Engineering	Zoology

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

The Master of Arts degree is offered with the following major:
English

The Major field listed above may also be selected as a minor field.

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. At the option of the department, the Graduate Faculty representative may be selected when a research topic is chosen.

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. In addition a minimum of one semester or two summer sessions of full-time graduate work (12 semester hours) must be spent on campus. Residence credit is given only for graduate credit earned in courses offered by South Dakota State.

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. 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 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 Master's Degree student during his first term of study must work out a Plan of Study. 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. It must be submitted prior to the end of the first semester of Graduate work. The student's 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.

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), 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

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, 3d ed., 1969, available from the Bookstore, may be helpful.

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 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 the oral examination. If accepted by the examination committee, the major adviser and the Associate Dean of the Graduate School, one grade of Satisfactory (E) for all the thesis is turned in.

The original copy of the thesis must be filed with the Graduate Office for examination at least 10 days (excluding Sundays and holidays) before the oral examination. The student should distribute 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 has been paid for the cost of binding. This should be completed five days prior to Commencement.

Non-thesis Option "B" in Economics and Physical Education

Students may complete a Master of Science degree in Economics without a thesis under option "B." Option "B" requires 32 credit hours of course work, including 2 hours of Econ 690 (Special Problems) for a research paper. Further details should be obtained from the Economics Department.

Students may complete a Master of Science degree in Physical Education without a thesis under options "B" or "C." Option "B" requires 32 credit hours of course work, including 3 hours of HPER 793 (Individual Research) for a research paper. Option "C" requires 35 credit hours of course work, a comprehensive written examination and an oral examination. Further details should be obtained for both "B" and "C" from the Health, Physical Education and Recreation Department.

Language Requirement

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

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 10 days (excluding Sundays and holidays) before Commencement.

The examining committee includes (1) the major adviser (chairman), (2) a member of the Graduate Faculty appointed by the Associate 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	Social Science*
Education	Mathematics
Guidance and Counseling	

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 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 research report. The credit requirements for the options are:

Option A: A minimum of 32 graduate credits beyond the Bachelor's degree. Two 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. No research problem is required, but a comprehensive written examination is required in addition to the final oral examination.

*See "Special Majors" on page 14.

Requirements for the Major

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

Option B: Of the 35 graduate credits required, 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. Courses in the major department may be used as supporting courses, provided they are considered sufficiently diverse by the major department.

Students majoring in Mathematics or Social Science must take their minor in Education.

Plan of Study

During the first term of work, a graduate student should plan with his adviser(s) the Plan of Study for the Master of Education degree. This plan, 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 Associate 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 action taken by the Associate Dean.

Once the Plan of Study is approved, all changes must be requested on a form furnished by the Graduate Office. To be allowed, these changes must be approved by the adviser, the department head or committee chairman, and the Associate Dean.

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

The research problem must account for two credits in the major. The 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.

A copy of the research report must be filed at the Graduate Office 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 five days before Commencement.

Examinations

Option A: Candidates for the Master of Education degree under Option A must pass an oral examination covering the research and courses included in the graduate program. A written examination over the course work may be required by the department. This must be done not less than 10 days (excluding Sundays and holidays) before Commencement. Before taking either examination, the student must be admitted to candidacy.

Option B: Candidates under Option B must pass a comprehensive written examination over the coursework in their program. A department, with the concurrence of the Graduate Faculty representative, may require or

dispense with an oral examination.^o This Graduate Faculty representative will be appointed prior to the written examination by the Associate Dean at the request of the department in order to participate in determining whether to exempt a student.

The examining committee under either option is composed of: (1) the major adviser (chairman), (2) a member appointed by the Associate Dean and representing the Graduate Faculty, (3) one additional representative from the major field, and (4) one representative from the minor or supporting field. Except for the representative of the Graduate Faculty, the major adviser selects the committee 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	Science or Dairy Science Departments
Agronomy	Civil Engineering
Animal Science—offered in the Animal	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 complete a Master's degree unless they have a grade point average of "B" (3.0) or better for the last two years of undergraduate study.

Residence and Credit Requirements

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 50 credits at South Dakota State and one academic year of full-time work (or the equivalent in continuous half-time 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 Doctor of Philosophy degree is not completed within eight years from 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 eight years previously cannot be applied toward the Doctor of Philosophy degree except by permission of the advisory committee and the Associate Dean of the Graduate School. Certification of updating may be accomplished by completion of a form from the Graduate School by the Advisory Committee.

The Advisory Committee

During the student's first semester in residence the major adviser will recommend to the Associate Dean members of an advisory committee as follows:

- (1) The major adviser who acts as chairman of the committee.
- (2) The head or representative of the major department or of a department in the area of the major.
- (3) An additional member of the major department or a related department.
- (4) The minor adviser or a representative from an area where the supporting courses will be taken.
- (5) In addition, the associate dean will select a fifth 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. The above five members shall be members of the Graduate Faculty.

^oThis option to require or dispense with oral examinations for Master of Education, Option B, students was granted by the Graduate Faculty on May 20, 1971, for a two-year trial period ending May 19, 1973.

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.

Plan of Study

Within six weeks after appointment, the advisory committee will meet with the student to plan a complete Plan of Study and to consider a thesis topic. The Plan of Study must be forwarded to the Graduate Office within two weeks after the meeting. The Plan is subject to approval by the Associate Dean, and until it is approved the student cannot take the preliminary examination.

Any changes in the Plan 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 are available at the Graduate Office.

Transfer of Credits

Graduate 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. 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. Not all courses need to be in 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 may apply. All courses applying in the minor or supporting fields must be taken outside the major department or area. Courses in the major department may be used as supporting courses, provided they are considered sufficiently diverse by the major department.

Research Tool Requirements

Each department with the approval of the Graduate Council shall determine the research tool requirements for their students. Research tools involving fields not closely related to the field of study and used in advanced research may include foreign languages, statistics, computer programming, or other areas. Credits earned in attaining proficiency in research tools may not be included in the degree program. Specific departments should be consulted for their requirements.

Preliminary Examinations

When coursework has been substantially completed and the research tool requirement has been met, preliminary examinations covering coursework are taken. The first is a comprehensive written examination which is followed on satisfactory completion by an oral examination.

The advisory committee arranges for examinations and conducts them at times approved by the Associate Dean. Review of the examinations is accomplished by all members of the advisory committee, the results are reported to the Associate Dean of the Graduate School on an appropriate form and copies of the written examinations are filed in the major department office.

The preliminary examinations must be completed satisfactorily six months before the final examination is taken.

Admission to Candidacy

Upon satisfactory completion of the preliminary written and oral examinations a Ph.D. student is admitted to candidacy. Thereupon a student must register continuously each semester during the academic year (fall, spring and summer) until the Ph.D. is awarded. Registration shall be for courses, including thesis, or by Thesis 790, Section 2.

Failure to do so will automatically terminate candidacy for the degree. Reinstatement requires retaking the preliminary examination.

The Thesis

The thesis should represent 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 adviser, the original is delivered to the Graduate Office 10 days (excluding Sundays and holidays) prior to the final oral examination. After the thesis is found acceptable as to form by the Graduate Office, copies are delivered to the advisory committee for their examination.

After the final oral examination, all necessary corrections in the thesis are made and the first two copies are delivered to the Graduate Office five days prior to Commencement. A \$5 fee is paid at the library to cover the cost of binding the two library copies.

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 \$20 covering the cost of microfilming must be paid. This must be done five days prior to Commencement.

The Final Examination

The final oral examination is scheduled no sooner than six 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 the thesis to test 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 10 days prior to Commencement.

SPECIAL MAJORS

One special major is offered under the Master of Education degree program. It is described below since it is directed by a committee instead of a single department.

Social Science Major (Master of Education)

The Social Science major is for 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) 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 the state certification requirements.

The requirements for the major are met in the departments of Economics, History and Geography; Political Science, and Sociology. Nine 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.

Courses of Instruction

COURSE NUMBERING SYSTEM

700-799 series

Courses numbered from 700 through 799 are graduate level and are open to graduate students only (except seniors by permission. 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, but 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 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 percent 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 eight credits are earned in this series, they would be equivalent to six graduate credits.
- (2) For the Master of Arts, Master of Science or Master of Education degrees, no more than seven converted credits may be applied to the graduate program. They may be applied in the major, minor, or supporting course areas.
- (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 course areas.
- (4) Transfer credits may not be applied.
- (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 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.

DEPARTMENT OF AEROSPACE MANAGEMENT

Professor Tristram J. Cummins, Head

Graduate major offered: Presently no major is offered.**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. A background in 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)**662 Advanced Management Concepts 2(2,0)**

Study of modern management theory as a basis for evaluation of its application in both the military and non-military organization. After a historical review of the development of management thought, management will be defined by: the functional approach, the behavioralistic and human relations approach, and the systems approach.

672 Planning in the Management Process 2(2,0)

Planning is divided into four sections: as a function of management, and the part planning plays in achieving overall organizational goals; a description of the activities and criteria which must be developed to allow efficient planning to take place; the role of the various levels of management in the planning process; a description of the parts of plans, types of plans, methods for analyzing data and making decisions, and problems encountered in the implementation of approved plans.

682 Theory and Management of Systems 2(2,0)

Emphasis is directed to the systems approach and the contribution this approach has made, by its introduction to concepts, theory and practice of management in non-military organizations. To provide an understanding of selected functions operations within Department of Defense and the Air Force. Selected aspects or techniques inherent in the systems approach, in both military and non-military situations, will be researched and reported upon.

692 Logistics Management 2(2,0)

An introduction to the functions of supply, maintenance, and transportation as practiced in both military and non-military operations. Describes each major area and the interrelationships they form to provide support for the achievement of organizational goals. Discussion of each function includes specific analytical techniques used in the management of that function, e.g., economic order theory, queuing theory, simulation, and control theory.

DEPARTMENT OF AGRICULTURAL ENGINEERING

Professor D. L. Moe, Head

Professors DeLong, V. Myers, Turnquist, Wiersma; Associate Professors DeBoer, Johnson, Lytle, Young

Graduate major offered: Master of Science degree with major in Agricultural Engineering.
Doctor of Philosophy with 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. P, 412, 422. Alternate years. Spr 1973

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 strain gage pressure and force transducers. P, 2i15, Math 254. F 1973

623 Advanced Irrigation Engineering 3(2,3) S 1973

Theory and design of agricultural drainage. Irrigation principles, land preparation, design of surface and sprinkler irrigation systems. P, 414.

643 Ground Water Engineering in Agriculture

3(3,0)

Theory of ground water movement. Specific applications of flow into wells, into drains and flow to and from irrigation channels. P, EM 323. F 1973

652 Theoretical Micro-Climatology 2(2,0) F 1972

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 363.

702 Advanced Farm Buildings 2(2,0)

(Offered in 1973)

Analysis of farm animals and their environment employing engineering principles combined with biological principles. Homeothermic mechanisms of animals and the influence of thermal environment upon growth and production. P, AE 304. Alternate years.

722 Advanced Farm Land Engineering 2(2,0)

(Offered F 1972)

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. P, 423, PS 452. Alternate years.

742 Advanced Agricultural Tractors and Machines

2(2,0)

Units of instruction will be selected from the following areas: Tractor chassis mechanics and dynamics, transmissions, hydraulics, human factors considerations for agricultural machine operators, soil dynamics in tillage and machine-plant concepts. P, Math 333, and AE 484 or equivalent. Alternate years. F 1972

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 S 1972)

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

753 Energy Transfer in Agricultural Environment

3(2,2) (Offered in S 1973)

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

763 Programming Agricultural Systems 3(2,2)

(Offered in S 1974)

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. P, GE 290, Math 413 or equivalent.

781 Graduate Seminar I (1,0)

Discussion and reports of current topics and investigations in Agricultural Engineering. (Limit of 2 credits for M.S., 3 credits for Ph.D.)

790 Thesis**DEPARTMENT OF ANIMAL SCIENCE**

Professor Delwyn Dearborn, Head

Professors Carlson, Dinkel, Embry, Kamstra, Kohlmeyer, Kohler, Luther, Morgan, Wahlstrom, Johnson (Emeritus); Associate Professors Bush, Gartner, Lewis, McCarty, McCone

Graduate majors offered: Master of Science degree with a major in Animal 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 the following areas with results submitted as a technical paper:

1. Animal Breeding
2. Nutrition
3. Meats
4. Livestock Production
5. Range Management
6. Reproductive Physiology
7. Wool Technology
8. Poultry

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.

610 Special Topics 1-3 FS

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

613 Population Genetics 3(3,0) S

(Offered in 1973)

Genetic structure of populations and forces affecting this structure. Theories of biological variation, race and species formation. P, Bio 303 or equivalent. PS 614 or equivalent highly recommended. Alternate years.

614 Meat Technology 4(2,4) S (Offered in 1974)

Basic physical, chemical, microbiological and histological characteristics of meat and effects of var-

ious processing methods on meat products and by-products. P, 213. Alternate years.

683 Avian Nutrition 3(2,2) S (Offered in 1974)

Nutritional requirements and deficiency signs, peculiarities or digestive physiology, formulation of diets and dietary effects upon quantity, quality and efficiency of production of chickens, turkeys, pheasants, ducks and geese. P, 243, desirable antecedent 263, 353. 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, PS 614 or equivalent.

703 Animal Nutrition 3(3,0) S (Offered in 1973)

Principles of nutrition in relation to growth, reproduction, lactation, fattening and work. P, Ch 244 and Z 304 or equivalent. Alternate years.

722 Animal Nutrition Laboratory 2(0,6) S

(Offered in 1973)

Laboratory methods course involving demonstration and practical work in techniques used in animal nutrition research. P, 244. Alternate years.

723 Ruminology 3(3,0)

See Dairy Science 723 for description.

743 Advanced Physiology of Reproduction

3(2,2) S (Offered in 1974)

Anatomical and physiological processes of reproduction in 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.

773 Nutritional Interrelationships 3(3,0) F

Relationships between nutrients in metabolism. Substitution and sparing effects. Comparing metabolic significance of required nutrients for different animal species.

790 Thesis in Animal Science as arranged.

DEPARTMENT OF BACTERIOLOGY

Professor Robert Pengra, Head
Professors Baker, Middaugh, Parikh

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

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 1-4 credits FSSu

Research problem in Microbiology. Four credits maximum. P, Senior standing and consent of instructor.

603 Virology 3(2,3) F

Viral and rickettsial diseases of animals, biochemical and biophysical properties of viral agents, viral replication in tissue culture, immune mechanism against virus diseases. The role of viral vaccines and antiviral drugs. P, 403 and consent of instructor.

604 Advanced Dairy Microbiology 4(2,4) S

(See description in Dairy Science.)

614 Molecular and Microbial Genetics 4(4,0) F

Designed to serve as a basic course in molecular genetics. Examples to illustrate genetic principles are drawn from all forms of life. Open to all students. P, Bio 303. A course in general bacteriology is recommended.

624 Systematic Bacteriology 4(2,4) S

(Offered in 1974)

Bacterial nomenclature and taxonomic relationships among bacterial families and genera. Practical laboratory identification and maintenance of bacteria. P, 304, alternate years.

701 Graduate Seminar 1(1,0) FSSu

P, graduate standing. Two credits maximum.

704 Bacterial Metabolism 4(2,4) F

(Offered in 1973)

Biological oxidations, fermentation mechanisms, metabolism of nitrogenous compounds, aerobic respirations, enzyme inductions and laboratory techniques. P, Bac 204 and Ch 244. Alternate years.

714 Industrial Microbiology 4(2,4) S

(Offered in 1973)

Techniques for production of microorganisms and their biochemical products of commercial importance. Laboratory studies with molds, yeasts, and bacteria to produce antibiotics, organic acids. P, 204; Ch. 244. Alternate years.

790 Thesis in Microbiology 5-7 FSSu

DEPARTMENT OF BOTANY AND BIOLOGY

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

Graduate majors offered: Master of Science degree with major in Biology.

Graduate minors offered: Botany or Biology.

Prerequisites for graduate study:

For the graduate major a Bachelor's degree, including 24 credits in biological sciences or consent.

For the graduate minor a Bachelor's degree, including 16 credits in biological sciences, or consent.

Botany Courses (Bot)

604 Growth and Development 4(1,6) S
 (Offered in 1973)

Relations of light, temperature, water, wind, growth regulators, nutrients and other factors to various stages of plant growth and development. P, 424, Ch 130. Alternate years.

614 Advanced Plant Physiology 4(1,6) S
 (Offered in 1974)

Role of organic and inorganic compounds in plant nutrition. Emphasis on photosynthesis, respiration, metabolism, and other cellular processes. P, 424, Ch 130. Alternate years.

600 Special Topics
 1. Radiation Biology
 2. Evolution
 3. To be designated

603 Strategies in Science Teaching 3(3,0) FSSu
 This course is designed to help the teacher and prospective teacher identify and teach certain processes deemed fundamental to science and scientific behavior. The emphasis will be not primarily of subject matter but on the general elements of the process which characterize the scientific method of analysis.

654 Biology of the Algae 4
 Survey of algal phylogeny, physiology, and ecology. Field and laboratory practice in collection, identification, and sampling techniques.

644 Advanced Plant Ecology 4(3,2)
 S Alternate Su 1973

Theoretical analysis of the trophic-dynamic or energy relationships of communities with emphasis on productivity. Literature reading. Laboratory work in techniques of community analysis. Field trips.

700 Special Topics
 1. Taxonomy
 2. Morphology
 3. Morphogenesis
 4. Anatomy
 5. To be designated

790 Thesis in Botany 5-7 as arranged FSSu

Biology Courses (Bio)

693 Principles and Techniques in Electron Microscopy 3
 Principles and techniques of electron microscopy, crosslisting in Animal Science, Bacteriology, Entomology-Zoology, Plant Science, Horticulture. Techniques and instruments basic to the preparation, examination and interpretation of specimens with the electron microscope.

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.

790 Thesis in Biology 5-7

DEPARTMENT OF CHEMISTRY

Professor Victor S. Webster, Head
 Professors Brandwein, Emerick, Greb (Emeritus), Halverson, Johnson, Klug, Olson, O. Spinar, Wadsworth, Whitehead; Associate Professors Gehrke, Greichus, Grove, Jensen, Olson, E., Palmer, Rue, Assistant Professor Guss (courtesy)

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

Doctor of Philosophy degree with a major in Chemistry. Program suspended by Regents of Education as of June 22, 1972.

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** 1-4(0,3-12) FS
Research problems in chemistry. Strongly recommended for senior chemistry majors. P, consent of instructor. Limited to a total of 4 credits.
- 622 Atomic and Molecular Structure** 2(2,0) S
(Offered in 1973)
Molecular binding and introduction to quantum mechanics. P, 320, 420. Alternate years.
- 623 Structural Determination of Organic Compounds** 3(1,6) F
The determination of the structure of organic compounds primarily by spectroscopic techniques. P, 320, 420.
- 633 Advanced Inorganic Chemistry** 3(3,0) F
Selected topics in modern inorganic chemistry. P, 413.
- 643 Advanced Inorganic Chemistry** 3(3,0) S
(Offered in 1973)
Selected topics in modern inorganic chemistry. P, 413. Alternate years.
- 653 Descriptive Inorganic Chemistry** 3(2,3) S
(Offered in 1974)
Laboratory work will include preparation and purification of typical inorganic compounds. P, 130 (4 credits) or 134, 214, 353. Alternate years.
- 663 Selected Topics in Analytical Chemistry** 3(2,3) S (Offered in 1974)
Theory and practice in modern analytical chemistry. P, 424. Alternate years.
- 673 Selected Topics in Analytical Chemistry** 2(2,0) S (Offered in 1973)
Theory and practice in modern analytical chemistry. P, 424. Alternate years.
- Pha 604 Bionucleonics** 4(3,3) S
- 703 Lipids** 3(3,0) F (Offered in 1973)
Selected topics on lipids and related compounds. P, 615 or 705. Alternate years.
- 705 Principles of Biochemistry** 5(3,6) F
Chemistry of biological processes of plants and animals. P, 244 or 324.
- 711-721 Seminar** 1(1,0) FS
Required of all graduate majors in chemistry.
- 713 Advanced Physical Chemistry** 3(3,0) FS
(Offered in 1973)
Selected topics in physical chemistry. P, 420. Alternate years.
- Sec. 1—Classical Thermodynamics
Sec. 2—Quantum Chemistry I
Sec. 3—Electrochemistry
Each section may be taken only once.
- 722 Stereochemistry of Carbon Compounds** 2(2,0) S (Offered in 1974)
Isomerism due to spatial arrangement of atoms or groups. P, 320. Alternate years.
- 723 Advanced Physical Chemistry** 3(3,0) S
(Offered in 1973)
Selected topics in Physical Chemistry. P, 420. Alternate years.
Sec. 1—Statistical Thermodynamics
Sec. 2—Quantum Chemistry II
Sec. 3—Surface Chemistry
Sec. 4—Kinetics
Each section may be taken only once.
- 732 Biochemical Techniques** 2(0,6) S
(Offered in 1973)
Research techniques of modern biochemistry pertaining to separation, isolation, purification and measurement of compounds of biological importance. P, 615 or 705. Alternate years.
- 733-743 Advanced Organic Chemistry** 3(3,0) FS
(Offered in 1973-74)
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 or 705.
- 763 Advanced Biochemistry** 3(3,0) S
A continuation of Ch 705 with major emphasis on intermediary metabolism and the physical chemistry of biological macromolecules. P, 615 or 705.
- 773 Carbohydrates** 3(3,0) F (Offered in 1973)
Selected topics on carbohydrates. P, 615 or 705. Alternate years.
- 783 Proteins and Nucleic Acids** 3(3,0) S
(Offered in 1974)
Selected topics on proteins and nucleic acids. P, 615 or 705. Alternate years.
- 790 Thesis in Chemistry** credit as arranged FS
The following physics courses may be used in either the graduate major or minor program.
- Phy 732 Statistical Mechanics** 2(2,0); P, 703.
- Phy 743 Theory of the Solid State** 3(3,0); P, 443.
- Phy 763 Advanced Quantum Mechanics** 3(3,0) F;
P, Phy 354, 364.
- Phy 783 Group Theory in Quantum Mechanics** 3(3,0) S; P, Phy 763.

DEPARTMENT OF CHILD DEVELOPMENT AND FAMILY RELATIONS

Professor Jay Richardson, Head

Graduate major offered: Master of Science degree with a major in Child Development and Family Relations. Program suspended by Regents of Education as of June 22, 1972.

Graduate minor offered: Child Development and Family Relations.

Prerequisites for graduate study:

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

Child Development and Family Relations Courses (CD)

612 American Woman 2(2,0) S

(On sufficient 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 of instructor.

630 Seminar in Human Development and Family Relations 1-2 (1-2,0) (On sufficient demand)

Reports and discussions of current literature, including research methodology in area of human de-

velopment, personality, family relations, marriage and family counseling. Maximum of 4 credits may be applied on advanced degree. P, consent of instructor.

680 Special Problems in Human Development and Family Relations 2-4 credits as arranged

Individual study for qualified students. P, consent of instructor.

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.

DEPARTMENT OF CIVIL ENGINEERING

Professor E. E. Johnson, Head

Professors Andersen, Chang, Dornbush, Koepsell, Shoukry;

Associate Professors Larson, Lee

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)

600 Seminar 0-1(1,0) FSSu

Review of literature on engineering. Reading, reports and round table conferences for effective delivery of information. P, consent of instructor.

602 Industrial Waste Treatment 2(2,0) S

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) F

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 FS

Elective course for special or detailed study or investigation. P, senior standing in Civil Engineering.

613 Advanced Structural Mechanics 3(2,3) S

Matrix methods, Arches and Rings, Buckling, Structural Dynamics, Computer solutions. P, 413 433.

623 Prestressed Concrete 3(3,0) Su

Theory and design of prestressed concrete including pre-tensioning and post-tensioning. P, 443.

633 Hydraulic Design 3(3,0) F

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.

643 Advanced Hydraulics 3(2,3) S

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) F

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.

663 Open Channel Hydraulics 3(3,0) F

Energy and momentum principles in open channel flow, flow resistance, flow in uniform and non-uniform channels, flood routing. P, 423.

673 Fluvial Hydraulics 3(3,0) S

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.

693 Advanced Soils Engineering 3(2,3) S

Application of basic soil mechanics to engineering problems. Stability, compaction, embankments, seepage, draining, and stabilization. P, 444.

713 Water Resources Engineering 3(3,0) S

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.

723 Water Treatment Plant Design 3(1,6) F

Water supply sources, design of treatment plants, cost estimates of water supply systems. P, graduate standing.

733 Advanced Indeterminate Structures 3(3,0) F

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) S

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) F

Modes of failure, plastic hinges, design rules and applications. P, graduate standing.

743 Elastic Stability 3(3,0) S

Buckling of columns and plates. Lateral buckling of beams; stability of rings. P, graduate standing.

753 Waste Water Treatment Plant Design

3(1,6) S

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) S

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) S

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) Su

Highway administration, highway and transportation costs, road user benefits, cost benefit ratio.

783 Advanced Transportation Engineering 3(2,3) F

Planning and designing of railroads, highways, water and air transportation facilities and coordination of transportation facilities.

790 Thesis FSSu

Independent investigation of special problem and written thesis.

DEPARTMENT OF DAIRY SCIENCE

Professor J. H. Martin, Head

Professors Baker, Dracy, Surgeon, Voelker, Young; Associate Professor Bartle (Emeritus)

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 Advanced Dairy Microbiology 4(2,4) S**

(Offered in 1973)

Role of microorganisms in manufacture and spoilage of manufactured dairy products. P, 313. Alternate years.

612 Laboratory Techniques in Dairy Science 2(0,6) F

(Offered in 1972)

Current research techniques in Dairy Science including photometry; electrophoresis; and column, thin-layer, and gas chromatography of milk and plant or animal tissues. P, Ch 244 and/or consent. Alternate years.

623 Physiology of Lactation 3(3,0) S

(Offered in 1973)

Anatomy and physiology of mammary glands. Factors affecting quality and quantity of milk. P, Z 304. Alternate years.

680 Dairy Science Problems 1-3 FSSu

Investigation of problems in dairy production or dairy manufacturing. Results submitted as a technical paper. P, consent of instructor.

701 Seminar 1(1,0) S

Problems in dairy production, dairy manufactur-

ing, 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) S (Offered in 1973)

Biochemical, physiological, and microbiological activity occurring in the rumen and the relation of

rumen function to animal response. P, AS 703 or consent. Alternate years.

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 Aanderud, Helfinstine, Kohlmeyer, Lockner, Myers, Rose, Smythe; Associate Professors Antonides, Berry, Gilbert, Greenbaum, Hsia, Murra

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

Doctor of Philosophy degree with a major in Agricultural Economics. Program suspended by Regents of Education as of June 22, 1972.

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.

Non-thesis Option: Students may complete a Master of Science degree in Economics without a thesis under Option B. Option B requires 32 credit hours of course work, including 2 hours of Econ 690 (Special Problems) for a research paper.

Economics Courses (Econ)

603 Advanced Quantitative Economics 3(3,0) S
(Offered in 1973)

Econometric and other quantitative methods applied to decision-making. Topics studied will normally involve market and income models, linear programming, queuing theory, inventory models, and simulation. P, 314. Alternate years.

613 Economics of the Public Sector 3(3,0) F
(Offered in 1972)

Governmental operations, policies, and revenues as related to employment, productivity, and economic welfare. Alternatives that would affect social services, education, commerce and trade, fiscal policies, and quality of life. Alternate years.

623 Advanced Farm and Ranch Management 3(3,0) S (Offered in 1973)

Principles of production economics. Review of Management methods, decision-making, and problem recognition. Emphasis on planning and organizing the farm or ranch. Budgeting, computerized accounting, and linear programming. P, 213 and 234 or consent. Alternate years.

633 Economics for High School Teachers
(Workshop) Su

Basic course for preparation of High School economics instructors. Purposes of economic analysis, goals of a high school economics course, adaptation of student's prior knowledge to economic analysis, application of graphic and mathematical tools to micro and macro economic analysis, behavioral vs. quantitative approaches to analysis, and interpretation of economic phenomena.

643 Economics of the International Sector 3(3,0) S (Offered in 1973)

International flow of trade and balance of payments. Monetary and fiscal policies. Trade controls and their effect upon agricultural and domestic economy. Significant current developments in trade and finance. P, 213, 333 or consent. Alternate years.

663 Resource Economics for Environmental Control 3(3,0) F (Offered in 1973)

Economic analyses applied to problems in conservation and development of natural resources. Effect of programs on land-use. Land institutions, tenure, zoning, and alternative resource 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 Market Power and Strategies 3(3,0) S
(Offered in 1974)

The elements involved in market power and how they function. Government regulation of markets. The consumer movement. Grades, brands, advertising and promotion. Current changes in marketing strategies. P, 323. 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.

691 Research Methods 1(1,0) F

Planning, conducting, analyzing, and reporting economic research. Formulation and testing of hypotheses. Methods of summary and analysis. Sources of data.

693 Economics of Development 3(3,0) F

(Offered in 1973)

701 Seminar in Economics 1(1,0)

702 Advanced Macroeconomics 2(2,0) S

712 Advanced Microeconomics 2(2,0) F

780 Applied Economic Theory FS

790 Thesis in Economics as arranged

DEPARTMENT OF EDUCATION

Professor Duane Everett, Head

Professors Foreman, Gadda, Larsen, Schmieding, Scholten, Schultz (Emeritus), Sundet, Wiseman (Emeritus) Associate Professor Herold (Emeritus)

Graduate majors offered: Master of Education degree with a major in Education, Agricultural Education, or Guidance and Counseling.

(See also Special Major on page 14.)

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 are required for those preparing to be high 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.

The Graduate Program in Education is designed to provide professional preparation above the Bachelor's Degree for teachers. The program includes the following options: (1) Education Administration Program, (2) Teacher Intern Program, (3) a major in the teaching field and a minor in education. (See details under departmental areas.) For the graduate major in Educational Administration the Bachelor's Degree and a teaching certificate are required. Admission to the program does not require experience. However, it is recognized that those persons who complete the program should qualify for an Administrative Certificate. The state of South Dakota issues an Administrative Certificate on the basis of the Master's Degree and two years of successful teaching experience. Majors must also complete the data sheet for candidates and provide the department with two letters of recommendation from persons who have knowledge of their professional competencies. Applicants may be asked to meet with the Departmental Selection Committee prior to admission.

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, followup 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 student 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)

606 Internship in Education 6(0,6) FSSu

On-the-job participation in teaching in the public schools under the supervision of a local school instructor and a staff member from the Department of Education.

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 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.

Ed 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.)

Ed 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 in Language Skills and Communications programs and for undergraduates who plan to teach.

Ed 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.

Ed 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.

703 Introduction to Graduate Study 3(3,0) FSSu

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.

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

The nature of supervision, evaluation and instruction and teacher performance. Techniques, plans and procedures for improving the course of study and instruction in the public schools.

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.

763 Advanced Educational Psychology 3(3,0) FSu

Modern psychological theories of education with particular emphasis on the developmental, motivational, learning and adjustment processes of children; evaluate and interpret research findings; developing a set of techniques for studying children and the problems that arise in their education.

Guidance and Counseling Courses (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) FSSu

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 cr.

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.

613 Learning Disorders of Children 3(3,0) Su

Overview of various learning deficits, remedial procedures, and consideration of psychological assessments.

623 Mental Health and Personality Development

3(3,0) FSu

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.

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.

700 Seminar in Guidance and Counseling 1-2 Cr.

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

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.

773 Principles of College Teaching 3(3,0) S

Procedures, objectives, and evaluation of instruction; professional relationships. Individual studies according to student's field.

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.

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, 702, and 10 education credits.

majors. P, 20 semester credits in guidance and counseling and consent of instructor.

702 Individual Appraisal and Evaluation 2(2,0) Su

Techniques for discovering characteristics of individual students. Students will develop competencies in the use of cumulative records, case study procedures, sociometric devices, and other non-standard test instruments. Recording, analyzing, compiling, and interpreting data as they relate to counseling. A synthesis of information about students.

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 Testing 4(4,0) FSSu

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.

713 Elementary School Guidance 3 cr. SSu

The principles of guidance and their application at the elementary level. Emphasis is on the function of the counselor in meeting children's needs. The nature of guidance and of the guidance services in elementary education. Post-graduate standing.

723 Occupational Education 3(3,0) FSu

Using, reviewing, and evaluating occupational information. Sources and types of materials and occupational filing plans. Securing occupational information.

742 Group Procedures 2(2,0) FSSu

Purpose and methods of group as applied to a sound guidance program. Concentration on group processes. Theoretical basis for group work in guid-

ance, orientation activities, classroom instruction, educational and vocational planning, and group guidance. P, consent of instructor. Limited to advanced GC majors.

743 Counseling Theory and Practice 3(3,0) FSSu

Theories, methods, and application of the counseling processes at all levels. P, consent of instructor.

750 Employment Service Counseling Practicum

2-4 cr. Su

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. P, advanced graduate majors in Guidance 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 FSSu

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. Limited to advanced graduate majors in guidance and counseling and consent of instructor.

Industrial Arts Education Courses (IAE)

612 Wood Finishing 2(2,0) Su

Use of all types of finishes and fillers. Use of air guns and brushes. Study of stains, solvents, and finish removers. Application of finishes on various types of wood. P, IAE, Senior standing or consent of instructor.

622 History of Industrial Arts 2(2,0) Su

Development of Industrial Arts from the Swiss Cantons to the rest of the world. Introduction of the Manual Arts to the American Curriculum. The Unions and Industrial Arts and Vocational Education. Legislation for the Industrial Arts Field. P, IAE, Senior standing or consent of instructor.

DEPARTMENT OF ELECTRICAL ENGINEERING

Associate Professor V. G. Ellerbruch, Acting Head

Professors Gamble (Emeritus), Manning (Emeritus), Storry

Associate Professors Knabach, Kurtenbach, Nelson, Sander; Assistant Professor Higgins

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.

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.

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. P, consent of instructor.

623 Communication Systems 3(3,0) S

Information transmission, modulation, sampling theory, noise sources, introduction to statistical theory of communication. P, 333, 344.

610 Special Electrical Problems 1-3

(On sufficient demand)

Special problem assigned in the field of electrical engineering. P, consent of instructor.

632 Nonlinear Analysis 2(2,0)

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.

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.

633 Computer Analysis of Power Systems 3(3,0)

Concepts used in formulating load flow and fault study problems for computer solution. P, consent of instructor.

613 Power System Stability 3(3,0)

Inertia constant, swing-curves, equal area criterion, as applied to transient stability studies. P, consent of instructor.

643 Microwave Theory 3(3,0)

Theory of transmission lines, resonant cavities, waveguide junctions, and components. Active devices, lasers, masers. P, 373. Alternate years.

653 Microwave Measurements 3(2,3)

Microwave techniques, devices, transmission lines, and instrumentation. P, 373.

662 Symmetrical Components 2(2,0)

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.

663 Digital Logic 3(2,3) or 3(3,0)

Logic functions; design and minimization of combinational and sequential circuits. P, 344.

673 Integrated Circuit Engineering 3(3,0)

Analysis and design of transistor circuits with and without feedback. Gain sensitivity studies, field-effect transistor circuits. P, 344 or equivalent.

683 Electromagnetic Radiating Systems 3(3,0)

Electromagnetic waves; Poynting vector and the flow of power; guided waves; wave guides; radiation and radiation impedance; ground wave propagation; sky wave propagation. P, 373. Alternate years.

692 Direct Energy Conversion 2(2,0)

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 de-

sign. 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.

713 Advanced Circuit Theory I 3(3,0)

Application of classical mathematics to circuit response with various driving functions. P, 333.

723 Advanced Circuit Theory II 3(3,0)

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 Statistical Communication Theory 3(3,0)

Synchronization methods, signal analysis, detection and estimation theory. P, 623.

743 Advanced Electronics 3(3,0)

Molecular and plasma electronics, masers and lasers, electronics systems engineering, communication theory.

753 Network Synthesis 3(3,0)

Modern methods of network synthesis applicable to equalizers, filters and delay lines. P, 333 or equivalent.

773 Advanced Electronic Circuit Design 3(3,0)

A continuation of EE 673 with major emphasis on new semiconductor devices, oscillators, modulators and mixers. P, 673.

790 Thesis in Electrical Engineering 5-7 as arranged**ENGINEERING MECHANICS (EM)**

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 603 Introduction to Mechanics of a Continuous Medium 3(3,0) (On sufficient demand)**

The general theory of a continuous medium. Kinematics of deformation and flow; stress tensors; conservation of mass, momentum and energy; invariance requirements; constitutive equations for solids and fluids; applications for special problems. P, Math 393, EM 323.

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. P, EM 313, Math 393 or equivalent.

EM 623 Advanced Fluid Mechanics 3(3,0)

Fundamental notions of continuum, stress at a point, velocity field and vorticity. General principles of kinematics and dynamics of a fluid. Potential flow

and vortex motion. P, EM 323, Math 393 or equivalent.

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 613, 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 cylindrical shells. Analysis of open and closed cylindrical shells. Design problems in cylindrical shells. P, EM 313, Math 333, Math 393, or consent of the instructor.

DEPARTMENT OF ENGLISH

Professor Jack Marken, Head
 Professors Alexander, Giddings (Emeritus); Associate Professors Brown, Nagle (Emeritus),
 Walz, Witherington, Yarbrough

Graduate majors offered: Master of Arts 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:

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. An oral examination is required, in addition to being a defense of the thesis, 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 candidate 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 English 602 or a similar course has been taken previously, it is also required, it is strongly recommended that it 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.

Note: Before registering for graduate work leading toward a degree, 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) F (Offered in 1972)

Intensive study of an area of Elizabethan literature chosen to meet the needs and interests of the students. Alternate years.

602 **Research Tools in the Humanities** 2(2,0) F

Survey of reference and research materials of special value and interest to students of the Humanities. Required of all candidates for the M.A. degree in English.

610 **Victorian Literature** 2-3(2-3,0) S

Intensive study of the chief writers of British poetry and prose from 1840 to 1900, with emphasis on social and intellectual developments.

620 **Chaucer** 2-3(2-3,0) F (Offered in 1973)

A study of the major works of Chaucer, with some attention to his sources and his language. Alternate years.

622 **Development of the English Language** 2(2,0) S

The historical development of the English language. Attention is also given to etymology and semantics.

623 **Seminar in American Literature** 3(3,0)

Detailed investigation through discussion of major works, development of bibliographical materials and presentation of student papers of selected and specific writers and movements in American literature. The work of Faulkner, Twain, Whitman, American women writers, colonial writers or American expatriates are possible seminar subjects, depending upon staff.

630 **Advanced Studies in Seventeenth-Century Literature** 2-3(2-3,0)

Study of some important writer or aspect of English literature between 1603 and 1700.

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) F (Offered in 1972)

Selected European novels from Fielding to Camus. Alternate years.

640 Seminar in English Literature 2-3(2-3,0)

Intensive study of a selected type, author, or period of English literature.

650 Advanced Studies in Neo-Classical Literature 2-3(2-3,0)

Intensive study of an important writer or group of writers or of a significant aspect of English neoclassical literature.

653 The English Romantic Movement 3(3,0) F

The chief writers of English Romantic poetry and prose from 1789 to 1832, with emphasis on intellectual trends.

660 Contemporary Drama 2-3(2-3,0) F (Offered in 1973)

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. Alternate years.

663 Pre-Civil War American Writers 3(3,0) F (Offered in 1973)

A selection of writers from American transcendentalism and Romanticism. Alternate years.

673 The American Realists and Naturalists 3(3,0) S (Offered in 1974)

From Melville through the realistic and naturalis-

tic writers at the end of the 19th century. Alternate years.

680 Advanced Studies in Early English Literature 3(3,0) S (Offered in 1974)

Intensive study of a phase of English literature of the era before 1550. Alternate years.

683 Advanced Shakespeare 3(3,0) S (Offered in 1974)

Intensive study of selected plays of Shakespeare and significant Shakespearian criticism. Alternate years.

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.

702 Graduate Survey of English Literature 2(2,0) F

The student is expected to acquire a knowledge of English literature which will provide a satisfactory basis for continued graduate work.

712 Modern American Thought 2(2,0) S

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.

723 Problems in Teaching Composition and Literature 3(3,0) SSU**733 Literary Criticism 3(3,0) S (Offered in 1974)**

The tradition of literary criticism from Plato to present. Alternate years.

790 Thesis 5 credits. P, 602.**DEPARTMENT OF ENTOMOLOGY-ZOOLOGY**

Professor Robert Walstrom, Head

Professors Hartwig (Emeritus), Huggins, Kantack, Kirk (USDA), McDaniel, Ortman (USDA), Stoner (USDA), Swanson; Associate Professors Balsbaugh, Greichus, Jones, Kieckhefer (USDA), Krysan (USDA), Sutter (USDA)

Graduate majors offered: Master of Science degree with major in Entomology.

Master of Science degree with major in Zoology.

Doctor of Philosophy degree with major in Entomology. Program suspended by Regents of Education, June 22, 1972.

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 Special Topics in Entomology 2-6 Cr. FSSu**

Qualified students may investigate special topics of entomological study under supervision of department staff in the following and other selected areas:

Entomological Research Problems
Medical Entomology
Beekeeping
Acarology

613 Principles of Insect Taxonomy 3(2,2) F

(Offered in 1972)

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, 313 or its equivalent.

623 Insect Physiology 3(2,2) S (Offered in 1973)

Fundamental physiological processes in insects. Normal and abnormal functioning of adult and immature stages, developmental physiology, physiology of behavior. P, Ch 130 and permission of instructor.

643 Insect Ecology 3(2,2) S (Offered in 1973)

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, 103, 313, Z 302. Alternate years.

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 urged to attend all seminar sessions.)

702 Insectary Methods 2(1,2) F (Offered in 1973)

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 1973)

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, 402, Ch 130. Alternate years.

790 Thesis in Entomology 5-7 credits

*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.

Zoology Courses (Z)**600 Special Topics in Zoology 2-6 Cr. FSSu**

Qualified students may investigate special topics of zoological study under supervision of department staff in the following and other selected areas:

Zoological Research Problems
Human Genetics
Principles of Animal Taxonomy
Helminthology
History and Philosophy of Zoology
Developmental Genetics

614 Endocrinology 4(3,3) F (Offered in 1972)

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, 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 and consent of instructor.

674 Advanced Systemic Physiology 4(3,3) S

Physiology of digestion, rumination, urine formation, reproduction, nervous system, endocrine glands, and special senses. P, 664 or consent of instructor.

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. Major students are urged to attend all seminars.

790 Thesis in Zoology 5-7 credits as arranged FSSu**GENERAL STUDIES**

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.

General Studies Course (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, Foreign Language, History, Political Science and Rural Sociology.

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

Professor Stanley Marshall, Head

Professors Forsyth, Robinson; Associate Professors Blazey, Brynteson, Crabbs, Huether, Williamson

Graduate majors offered: Master of Science 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.

Non-thesis Options:

Students may complete a Master of Science degree in Physical Education without a thesis under options "B" or "C." Option "B" requires a minimum of 32 credit hours of course work, including 3 hours of HPER 793 (Individual Research) for a research paper. Option "C" requires a minimum of 35 credit hours of course work, a comprehensive written examination and an oral examination.

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.

680 Workshop in Health, Physical Education, and Recreation 1-3 Cr.

Workshop in specific areas. Lectures, conferences, committee work and outside assignments to increase understanding of a specific area. P, permission of department head.

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. Motor

learning. 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 laws applied to physical education and athletic situations. Interpretation of behavior in sports. 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**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.

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

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 Edward Hogan, Acting Head
Professors Kenny, Sewrey, Volstorff

Graduate major offered. (See Master of Education degree program with a major in Social Science, page 14.)

Graduate minor offered: History.

Prerequisites for graduate study:

For the graduate minor a Bachelor's degree with minor in History.

History Courses (Hist)**603 Mediaeval England 3(3,0) F**

A detailed study of England from the Anglo-Saxon invasion of the 5th Century to the Battle of Bosworth Field, 1485. The development of the English constitution and the emergence of England as a European power.

613 Modern Germany 3(3,0) S

Survey of Germany from 1648 to 1815. A detailed examination of German history in the 19th and 20th centuries, with special emphasis on the formation of the German nation, Bismarck, development of the German empire, the First World War, rise of Hitler, Nazi Germany and the Second World War.

623-633 European Intellectual History 3(3,0) FS

A history of literature 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)**602 Evolution of Geographic Thought 2(2,0) F**

The study of the history and development of geography and its theories, schools of thought and current ideas.

612 Advanced Studies in Land Utilization (Topical) 2(2,0) FS

An intensive examination of the physical and cultural factors affecting the nature and pattern of land utilization. Local and/or regional utilization, planning, and problems will be studied in detail in relation to the topic. This course may be repeated for credit. The specific topic to be studied will change each semester.

622 Advanced Regional Studies in Geography (Topical) 2(2,0) FS

Advanced study of selected topics in the regional geography of continents, nations, or states. This

course may be repeated for credit. The specific topic to be studied will change each semester.

632 Seminar in Systematic Geography (Topical) 2(2,0) FS

Advanced study of selected topics in systematic geography. The seminars will deal with one or more aspects of human geography, economic geography, political geography, population geography, historical geography. This course may be repeated for credit. The specific topic to be studied will change each semester.

670 Special Problems in Geography (Topical) 2-3-4 (2-3-4,0) FSSu

Selected studies in geography to meet the needs of advanced students.

710 Seminar in Geography 1-2-3 (1-2-3,0)

Studies in selected geography fields.

HOME ECONOMICS

Professor Frances 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 Hildegard Johnson, Acting Head

Professor McArthur (Emeritus), Associate Professor Gilbert (on leave)

Graduate majors offered: Master of Science degree with a 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, 455 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, 455 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, 455 or equivalent.

740 Research Problems in Home Economics Education 2-3 as arranged

Problem selected in some area of Home Economics Education. Problem analyzed, data gathered, treated statistically and prepared 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. Program suspended by Regents of Education as of June 22, 1972.

Graduate minor offered: Horticulture.

Prerequisites for graduate study:

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. P, consent of instructor.

731 Graduate Seminar 1(1,0) F

DEPARTMENT OF JOURNALISM AND MASS COMMUNICATION

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

Graduate majors offered: 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.

Courses outside the department of journalism are accepted toward the major with consent of the department head and adviser.

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

Graduate minors offered: Journalism. Printing Management.

Prerequisites for Graduate Study:

For the graduate major in Journalism, a bachelor's degree; a minimum of 16 credits in undergraduate journalism courses or the equivalent (Advanced English composition and advanced Speech courses in broadcasting are examples of equivalent); one year of practical experience in journalism or a related field (teaching of journalism or public information work will be accepted); plus demonstration of ability to write. Candidates not meeting the prerequisites may be accepted on condition, required to complete specified courses to meet deficiencies, and final exam may be postponed until all prerequisites are met to the satisfaction of the staff.

For the graduate minor in journalism, a bachelor's degree which must include one semester of newswriting or the equivalent.

Journalism Courses (J)

633 Theories of Communication 3(3,0) S

Examination of major theories of information transfer and communication channels.

640 Workshop in Mass Communications

643 Public Relations 3(3,0) SSu

Interpreting institutional and industrial policies and programs to the public. P, senior standing.

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. P, senior standing, consent.

660 Special Problems in Radio, Television, and Film
1-2 Cr.

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

713 Research Methods in Communications

3(3,0) FSu

Survey of major research in communications, study of methods employed; elementary statistical procedures.

720 Special Problems in Communications 1-3 credits

FSSu

Individual research problem. Consent of instructor.

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

790 Thesis in Journalism 1-6 credits FSSu

Printing Management Courses (PM)

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.

733 Production Management 3(3,0) F

Division of labor, lines of control, responsibility, supervisory techniques; tooling and logistics. P, 353 or equivalent.

DEPARTMENT OF MATHEMATICS

Associate Professor J. E. Richards, Acting Head
 Professors Engebretson, Kranzler, MacDougal (Emeritus), Walder, Wentz (Emeritus);
 Associate Professor Scholten

Graduate majors offered: Master of Education with a major in Mathematics.

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) FS**

Finite differences, interpolation, summation of series, numerical solution of differential equations and of systems of equations, numerical integration.

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, Bessel 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) (On demand)

Vector algebra, vector functions, vector calculus with emphasis on various physical applications. P, 254.

663 Projective Geometry 3(3,0) F

A synthetic and/or analytic approach to geometric properties invariant under projective transformations: theorems of Desargues, Pascal, Brianchon and applications. P, 254 or consent of instructor.

770-780 Advanced Topics in Mathematics

1-3(1-3,0) FS

Selected topics in mathematics to fit needs of graduate student. Limited to total of three credits. P, consent of staff.

DEPARTMENT OF MECHANICAL ENGINEERING

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

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

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 Seminar 0(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.

613 Advanced Analytical Methods 3(3,0)

Review of complex variables, contour integration and conformal mapping, Laplace and Fourier transforms, Green's function, asymptotic series, methods of steepest descent and stationary phase. P, 393 or equivalent.

633 Quality Control and Reliability 3(3,0)

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 procedure. P, 373, Math 413, or consent of instructor.

643 Introduction to Operations Research 3(3,0) F

History and organization of operations research, mathematical and statistical models in industrial decisions. The evaluation of alternatives by means of linear programming, queuing theory, deterministic and stochastic inventory models, game theory and Simulation. P, 373, Math 413 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, Math 333.

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, Math 393.

673 Statistical 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. P, 324; Math 393; Phy 373 or consent of instructor.

683 Viscous Flow Theory I 3(3,0)

A study of the fundamental laws and equations of motion for a viscous fluid; exact and approximate solutions for the laminar boundary layer; creeping flow; flow in internal passages; secondary flow; compressible boundary layers; thermal boundary layers in lamination motion. P, EM 623.

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. P, consent of instructor.

715 Systems Analysis 3(3,0) S

Analysis of industrial problems as systems of servicing stations with deterministic and stochastic inputs and service times using Queuing theory as a principal approach. Development of theoretical models. Digital computer simulation of complex systems. P, 643 or 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. Criteria of fail-safe design based upon fracture mechanics approach. P, 434, EM 613.

743 Viscous Flow Theory II 3(3,0)

Continuation of Viscous Flow Theory I. Theory of stability of laminar flows; transition; turbulence; Prandtl's mixing length theory and Taylor's vorticity transfer theory. P, 683.

763 Advanced Heat Transfer I 3(3,0)

Derivation of the heat conduction equation and basic relations. Advanced analytical methods of solutions of boundary value problems of steady and unsteady heat conduction and multidimensional heat conduction in several orthogonal coordinate systems. Non-linear problems including heat flow in anisotropic solids. P, 343, 393 or equivalent.

773 Advanced Heat Transfer II 3(3,0)

Derivation of the conservation equation and constitutive relationships for flow of viscous fluids. Analyses of the differential and integral equations of the hydrodynamic and thermal boundary layers. Similarity analysis of boundary layer equations. Special topics will include ablation, evaporative cooling, and transpiration cooling by gas injection. P, 343, 393 or equivalent.

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. 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 Elizabeth Rust, Head
Associate Professor Wills

Graduate major offered: Master of Science degree with a major in Nutrition and Food Science. Program suspended by Regents of Education as of June 22, 1972.

Graduate minor offered: Nutrition and Food Science.

Prerequisites for graduate study:

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

(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.

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

Professor G. W. Omodt, Head
Professor LeBlanc (Emeritus)

Graduate major offered: Master of Science degree with a major in Pharmaceutical Chemistry. Program suspended by Regents of Education as of June 22, 1972.

Graduate minor offered: Pharmaceutical Chemistry.

Prerequisites for graduate study:

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.

604 Bionucleonics 4(3,3) S

Theory and techniques for application of radioactive and stable isotopes to biological research.

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.)

DEPARTMENT OF PHARMACOLOGY

Associate Professor B. E. Hietbrink, Head

Graduate major offered: Master of Science degree with a major in Pharmacology. Program suspended by Regents of Education as of June 22, 1972.

Graduate minor offered: Pharmacology.

Prerequisites for graduate study:

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, 535. 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.

DEPARTMENT OF PHYSICS

Professor H. M. Froslic, Head

Professors Duffey, Graetzer, Miller, Williams; Assistant Professor Sippel

Graduate major offered: Master of Science degree with a major in Physics. Program suspended by Regents of Education as of June 22, 1972.

Graduate minor offered: Physics.

Prerequisites for graduate study:

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 heterogeneous reactors; reactor control and reactivity changes. 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) S

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 Schwarzschild 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 Boltzmann 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 SCIENCE

Professor Ray Moore, Head

Professors Brage, Carson, Derscheid, Dybing (USDA), Gardner, Fine, Kenefick, Kinch, Mankin, Nagel, Price (USDA), Ross, Rumbaugh, Semeniuk, Shank, Shubeck, Wells, Westin, White; Associate Professors Buchenau, Horton, Jenson (USDA), Lunden, Olson (USDA)

Graduate majors offered: Master of Science degree with a major in Agronomy or Plant Pathology.

Doctor of Philosophy degree with a major in Agronomy.

Prerequisites for graduate study:

A Bachelor's degree including prerequisites for the graduate courses elected.

Plant Science Courses (PS)

604 Advanced Plant Pathology I 4(2,4) F

(Offered in 1972)

Plant diseases caused by viruses, bacteria and mycoplasma-like organisms—including identification, development, symptoms, and control. Advanced laboratory research methods used in isolation, transmission, culture, purification, microscopy, serology, and investigation of the nature and properties of important plant pathogens. P, consent of instructor. Alternate years.

613 Advanced Plant Pathology II 3(3,0) S

(Offered in 1973)

Biochemistry and genetics of host-parasite interactions. Disease resistance. Alternate years.

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.

643 Physical Properties of Soils 3(3,0) F
(Offered in 1972)

Discussions of the physical properties of soils, the exchange of energy and water at soil surfaces, infiltration and redistribution of water, and soil physical properties related to plant growth. Emphasis will be given to applications in development and utilization of soil and water resources in a manner consistent with preservation of environmental quality. Consent of instructor. Alternate years.

654 Chemical Properties of Soils 4(4,0) F
(Offered in 1973)

Chemical considerations of the dynamic interactions of the soil solid-water-gas phases as affected by climate, soil age, kinds of minerals or organic matter, added fertilizer elements, and plants. P, consent of instructor. Alternate years.

663 Environmental and Physiological Aspects of Crop Production 3(3,0) F (Offered in 1972)

A system analysis of factors which limit or increase crop production and the potential for qualitative and quantitative adjustments. P Bot 424. Alternate years.

673 Advanced Genetics and Cytogenetics 3(2,3) S (Offered in 1974)

Procedures in genetic studies and the nature and behavior of chromosomes in relation to heredity. P, Bac 604. Alternate years.

700 Special Topics 1-6(1,3 per credit)

Advanced study of one or more selected topics:

- | | |
|-------------------------|---------------------|
| 1. Biometrical Genetics | 7. Soil Chemistry |
| 2. Experimental Design | 8. Soil Fertility |
| 3. Mycology | 9. Soil Genesis |
| 4. Mematology | 10. Soil Mineralogy |
| 5. Phytobacteriology | 11. Soil Physics |
| 6. Plant Breeding | 12. Virology |

780 Advanced Special Problems 1 or 2 FSSu

Advanced study and research in crops, soils, and plant pathology. P, consent of instructor.

781 Plant Science Seminar 1(1,0) FS

Reports and discussions of current investigations in Plant Science (two credits required for M.S.; three for Ph.D.).

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 15.)

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 for those students not minoring in Political Science.

610 Seminar in Political Science 1-2-3(1-2-3,0)

Studies in selected Political Science fields.

670 Special Problems in Political Science

1-2-3(1-2-3,0) FSSu

Individual guided research culminating in formal research paper.

DEPARTMENT OF PSYCHOLOGY

Associate Professor Richard Ritter, Head

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

Psychology Course (Psy)**623 Adolescent Psychology** 3(3,0) FSu

Physical, social, emotional, intellectual and vocational aspects of adolescent development. Emphasis

is upon increasing understanding of adolescents and their contemporary problems. P, 103 or 104.

DEPARTMENT OF RURAL SOCIOLOGY

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

Graduate Majors offered: Master of Science degree with a major in Rural Sociology.

Doctor of Philosophy degree with a major in Sociology.

(See also Master of Education degree program with major in Social Science on page 14.)

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 1973)
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.
- 623 Social Organization** 3(3,0) S
(Offered in 1973)
Elements of social organization. Analysis of social groups and complex social organizations. Examination of conditions and factors related to the integration and disintegration of social organizations. P, 393. Alternate years.
- 632 Social Demography** 2(2,0) F (Offered in 1972)
An exploration of population theory and methods focusing upon contemporary literature and the basic population processes of fertility, mortality, and migration. P, 353 or consent of instructor. Alternate years.
- 633 Leadership and Group Organization** 3(3,0) S
(Offered in 1974)
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.
- 643 Social Stratification** 3(3,0) S
(Offered in 1973)
A consideration of theories of social stratification. Examination of the relationship between social class and education, occupational choice, political preference, religious affiliation. Relationship between social class and social mobility. P, Open to students with sufficient background, consent of instructor. Alternate years.

- 683 Social Change** 3(3,0) S (Offered in 1974)
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. Alternate years.
- 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 organization or urban sociology. P, open to senior and graduate students with sufficient background.
- 703 Research Methods in Sociology** 3(3,0) S
(Offered in 1974)
Major emphasis will be given to research design, problems of measurement, methods of data collection, and analysis and interpretation of data. An integral part of the course will be the development of a research project dealing with some current sociological problem. P, 153, 393, and Econ 353. Alternate years.
- 713 Sociological Theory I** 3(3,0) F
(Offered in 1972)
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 1973)
Sociological theories and issues 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 Wayne Hoogestraat, Head
Professors Markland, Stine; Associate Professor Denton

Graduate majors offered: The Master of Arts degree with a major in Speech. Program suspended by Regents of Education as of June 22, 1972.

Graduate minor offered: Speech.

Prerequisites for graduate study:

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.

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
- 623 **Rhetorical Theory** 3(3,0) FSu
Historical development of rhetorical theory from classical to modern times. Alternate years, fall and summer.
- 633 **Theories of Communication** 3(3,0) FSu
(See Journalism Department.) May count toward a Speech Major.
- 643 **History of Theatre** 3(3,0) FSu
Periods, theatres, and representative dramatic lit-

erature from primitives to present day. Alternate years, fall and summer.

- 653 **Dramatic Literature** 3(3,0) SSu
Intensive readings of plays. Alternate years, spring and summer.
- 663 **History and Criticism of American Public Address** 3(3,0)
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(3,3) 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.
- 683 **General Semantics** 3(3,0) SSu
Relations between symbols; human behavior in reaction to symbols including unconscious attitudes, linguistic assumptions; and the objective systematization of language. Alternate years.
- 693 **Film Studies** 3(3,0) S
Film art forms, artists, and critics. Viewing and making films. Alternate years.

DEPARTMENT OF TEXTILES AND CLOTHING

Professor Lillian O. Lund, Acting Head
Professors Rosenberger (Emeritus) Stoflet

Graduate major offered: Master of Science degree with a major in Textiles and Clothing.
Program suspended by Regents of Education as of June 22, 1972.

Graduate minor offered: Textiles and Clothing.

Prerequisites for graduate study:

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

Textiles and Clothing Courses (TC)

- 603 **Textile Chemistry** 3(2,2)
(On sufficient demand)
Chemistry of textiles including laboratory study of physical and chemical properties of textile fibers and fabrics. Junior and Seniors by special permission.
- 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.
- 613 **Fashion, Art and Textiles Tour** 3(3,0) Su
*(Trip offered in 1973)
Development of intellectual understanding of the interrelationship of fashion, art and textiles of a specific area of the world. Study of the arts from an historical and contemporary approach. Open to juniors, seniors, and graduates.
- 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 1973)
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.

VETERINARY SCIENCE (Vet)

Associate Professor Edward J. Bicknell, Head

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.

600 Problems in Veterinary Science 1-3 credits FS
P, Vet 403, consent of staff.

DEPARTMENT OF WILDLIFE AND FISHERIES SCIENCES

Assistant Professor John Gates, Head

Associate Professors Hales (USDI), Linder (USDI), Nickum

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 and Fisheries Sciences Courses (WL)

600 Wildlife Research Problems 1-2 credits as arranged FS
(Limited to 2 credits for MS 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 (Offered in 1972)

Specific taxonomy and life histories, distribution, environmental requirements, habits, species interrelationships, population statistics, economic and recreational importance of species. P, 313, 404. Alternate years.

613 Advanced Wildlife Management 3(2,3) S

State and federal legislation pertinent to wildlife species and wildlife lands. State and federal agencies, their administration policies and programs. Regional management practices of game animals in the U. S. and foreign countries. P, 313, 404, Z 313.

623 Animal Population Dynamics 3(1,6) F

(Offered in 1972)
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, permission of instructor. Alternate years.

624 Limnology 4(2,6) S

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.

633 Wetlands Management 3(2,3) F 73

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 area in eastern South Dakota. P, 313, 324, 404, Z 313. Alternate years.

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.

724 Aquatic Ecology 4(2,6) F (Offered in 1973)

Qualitative and quantitative measurements of aquatic populations including primary production and biomass. Interrelationship of biotic and abiotic components of aquatic ecosystems. Productivity and factors affecting rates of transfer of energy and matter within aquatic communities will be stressed. Alternate years.

790 Thesis in Wildlife 5-7 credits as arranged FSSu

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